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DAVOS

AS

HEALTH-RESORT

DAVOS

AS HEALTH-RESORT

A HANDBOOK

CONTAINING CONTRIBUTIONS BY

A. F. BILL, M. D.; A. BRECKE, M. D.; THE VERY REV. DEAN J. HAURI, D. D.; F. JESSEN, M. D.; W. G. LOCKETT; P. K. MÜHLE, DR. PHIL.; E. NIENHAUS, M. D.; H. PHILIPPI, M. D.; W. SCHIBLER, M. D., DR. PHIL.; HOFRAT K. TURBAN, M. D.; H. J. A. van VOORNVELD, M. D.;

AND

INTRODUCTION

BY

W. R. HUGGARD,

M. A., M. D., F. R. C. P. LOND., H. B. M. CONSUL AT DAVOS
AUTHOR OF "A HANDBOOK OF CLIMATIC TREATMENT"

WITH 6 CHROMOTYPE REPRODUCTIONS OF
WATER COLOUR PAINTINGS AND 44 OTHER ILLUSTRATIONS

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ERRATUM.

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INTRODUCTION.

BY DR. W. R. HUGGARD, H. B. M. CONSUL.

My province is simply to introduce this book and its authors to the medical profession of the United Kingdom: it does not extend to the editing of the work. Thus I have the pleasant duty of presenting to my brethren at home foreign colleagues and men of letters who in their own countries would not need any introduction, some of whom are already well known in England, and indeed wherever scientific medicine has reached.

The German edition, on which the English edition is founded, was addressed to *Aerzte und Laien* — to Physicians and Laymen — greater latitude being sanctioned on the Continent as to the scope of articles communicated to the general public. In the adaptation of the volume for the medical profession in England some articles were more or less revised or altered; but traces remain which show the original intention of the book.

The views expressed in the various articles represent merely the standpoint of the individual writers — which is not always the same as my own. In all instances, however, the opinions advanced are those of men competent to form a sound judgment.

The English edition contains two articles, by Mr. W. G. Lockett and by Dr. Bill respectively, in addition to those that appeared in the German issue. Mr. W. G. Lockett supplements Dean Hauri's account of the history of

Davos by a brief record of the British colony. Dr. Bill contributes a valuable article dealing with the question of sport and phthisis.

Having known Davos for twenty years I have watched the development of the place and the various changes that have occurred either in response to waves of opinion from outside or owing to the influence of leading residents in moulding the habits and character of the community.

To a remarkable extent Davos has developed in many directions and on broad lines. It is the most cosmopolitan of resorts. It has become the home of the most modern treatment of tuberculosis, and at the same time it has become a centre for winter sports, such as tobogganing, skating, and ski-ing. This twofold development has proved an advantage for all classes of visitors — for persons who come for amusement, recreation, or sport, and for those who come solely on account of health. The advantage for the person seeking recreation is that nowhere else will be found the same combination of facilities for amusement with practical freedom from liability to infection by tuberculosis.

The absence of liability to tuberculosis in Davos and the presence of the danger elsewhere may excite surprise — until the circumstances are known. In Davos the most stringent precautions are taken to prevent the spread of tubercle germs. Every room vacated by a tubercular patient must be disinfected before it is again occupied. By this regulation, which is carefully carried out, danger is removed that tuberculosis may be caught from infected rooms. Davos is the only health resort where such precautions are in force. Other health or sport resorts, where by a pleasant fiction "invalids are not received", take no precautions whatever in regard to this danger. In a good

many such resorts with I which am acquainted, a fair proportion of the visitors are consumptives, who manage to disguise their malady more or less — usually not a very difficult affair. This fact is within my personal knowledge. Indeed we may safely assume that any spot that has become attractive by virtue of its climate and accommodation will soon be discovered by the great army of chronic tubercular cases, who travel mainly to find such conditions. Except at Davos, the only disinfection of rooms is that afforded by the first healthy person that comes along. When a room has been occupied by a healthy person after an invalid the question whether there is danger of infection can truthfully be answered — "The last person that occupied the room was perfectly well".

We have seen how people who travel for amusement or recreation benefit by the fact that Davos has developed as a health resort. The sporting side of Davos is not less an advantage for a large proportion of invalids. It counteracts the hypochondriacal atmosphere apt to prevail where there are no other interests than those of bodily condition, and is a most wholesome corrective to the tendency, which many invalids have, to wrap themselves up in their own symptoms and to view the world through a veil of ill-health. In some cases, indeed, the attraction of amusement or of sport is too much for the self-control of weak-willed invalids. In such cases recourse should be had to a sanatorium. But the majority of those who are unable to join in the winter sports find an agreeable diversion from their own worries in watching, for example, a toboggan gymkhana, the unrehearsed acrobatics of an amateur performer on skis, or the graceful movements of the expert.

For those who have not the needful self-control to withstand the temptation to indulge in forms of amusement that may have been forbidden to them there is a large choice of sanatoria in Davos.

The present volume is typical of another aspect of Davos. The contributors, sprung from many different lands in Europe, have now made Davos their more or less permanent home. One of the most pleasing characteristics of the place is the good feeling between the various nationalities that are drawn together either by health or by sport. Representatives of the different nations meet in friendly rivalry and unite in keeping up the several clubs and societies which are a marked feature of the place. Tobogganing, skating, ski-ing, clay-pigeon shooting, chess — each has its own cosmopolitan organization which brings together persons interested in the same pursuit.

Davos lends itself particularly well to residence all the year round. Old inhabitants as a rule prefer the summer to the winter; and at any season the climate compares not unfavourably with that of the lowlands. Persons of independent means can often with advantage take up their abode permanently in Davos. But the opportunities of engaging profitably in business are comparatively limited,

With these few words I commend the volume to my brethren at home; and I trust that they will find it as interesting as they will assuredly find the place when they make its acquaintance for themselves,

St. James Church and Old Tower

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HISTORICAL:

I. DAVOS AS COMMUNE AND HEALTH-RESORT

BY DR. J. HAURI.

In the heart of the Rhaetian Highlands, 5,250 feet above the level of the sea, is situated the health-resort of Davos. On account of the success obtained there in the treatment of lung and nerve complaints, Davos has during the past few decades gained for itself a world-wide reputation. Where forty years ago there were a few insignificant mountain hamlets, scattered about over green meadows, we see to-day a town of villas extending in a thin line for about a mile and a half. Large sanatoria and hotels, affording accommodation for a hundred, two hundred, or even a larger number of people, intermingle with boarding-houses, villas, and chalets, also fitted-up for the reception of invalids. The resort is embellished with assembly halls for concerts and theatricals, shops such as one finds in large towns, educational establishments, invalids' homes, churches and chapels, open spaces, promenades, and extensive gardens. It affords accommodation for more than four thousand visitors, and is frequented in summer as well as in winter by invalids, by those in need of recreation and holiday, by tourists, and by sportsmen. At the height of the winter season there are nearly 4200 visitors present in Davos at one and the same time, and during the year 1905 there was a grand total of 20,042 visitors.

We will offer only a few remarks on the geography of the Davos Valley, and then proceed to give a short sketch of its history. We shall have, on the other hand, to deal more fully with the rise and development of the place as a health-resort; for in the publications concerning Davos which have hitherto appeared, this part of our subject has for the most part met with but scant treatment.

Not far from the most northerly point of the Swiss Canton of the Grisons, is situated the railway station of Landquart, which can be reached from Zurich or from the Lake of Constance in from two to three hours. From Landquart a narrow-gauge railway runs up through the lovely valley of the Prättigau to its farthest large village, the summer health-resort of Klosters. Thence the line climbs in great curves up wooded mountain-slopes to the south. Magnificent views, now of the valley of the Prättigau and the green or rocky peaks of the Rhaetikon chain, now of the Silvretta glacier with its snow-covered mountain giants, in the near background, rejoice the eye of the traveller during this part of the journey. Passing the little village of Laret, which belongs geographically to the Prättigau, but politically to Davos, we reach in three quarters of an hour the summit of the pass, at Wolfgang, the highest point of the Davos Valley, 5360 feet above the level of the sea. Then a broad valley, shut in by green mountains, opens out before us, with high, boldly-formed peaks to the far south. The train runs for a few minutes along the wooded north and east shores of the Davos Lake, with a slight down gradient, to Davos-Dorf and Davos-Platz, the two principal parts of the health-resort, which, as the train proceeds, is fully unfolded to the gaze of the spectator.

The valley, or, as from time immemorial it has been called, the *Landschaft* (or commune) of Davos runs from

north-east to south-west for a distance of about 10 miles, down to the ravine of the "Züge". Four side-valleys, those of the Flüela, Dischma, Sertig and Monstein, enter the main, valley on its southern side; and their torrents unite with the main valley stream, the Landwasser. Owing to the amount of rubble which was deposited during earlier ages in the main valley, a level area about five-eights of a mile in width was formed over about a third of it at the higher end, and this is now covered with beautiful meadows. It is probable that the powerful mountain torrents which unite at this point have given the valley its name: Ad avanes, "by the waters", out of which "Tavaas" and finally "Davos" were eventually developed. It is on the north-westerly part of this valley-plain, and on the slopes rising from it, that the health-resort has grown up; but several fine sanatoria and some smaller boarding-houses are also to be found quite near the Lake, i. e., higher up the valley, and on sunny heights of its south-eastern side. There is even a sanatorium on the Schatzalp, 1000 feet higher. The mountains which enclose the valley rise to a height of nearly 9000 feet above sea-level. Still higher mountains, partly glacier-covered, tower up at the end of the side-valleys, but these are so far away that even in winter they do not shorten the duration of sunshine. To the north, Davos is completely sheltered against raw winds by the Schlappin chain, 9200 feet high. In addition to Laret, Davos-Dorf, and Davos-Platz, there are other small villages in the valley, all in the lower, narrower portion of it: Frauenkirch and Glaris, near the plain of the valley (what is called in German the *Talsohle)*, and Clavadel and Monstein on sunny mountain ledges. There are also some groups of houses in the side valleys. All these places have from of old formed only one political commune: Davos.

Until it began to be a health-resort, i. e., until about the year 1865, the Davos district was inhabited exclusively by German peasantry, whose forefathers settled in this high-lying valley in the 13th. century. There is a legend that the valley was discovered by a party of hunters only a short time before this event; but antiquarian discoveries and records found in old documents leave no room for doubt that the valley was know in the early Middle Ages and even in the time of the Romans. Part of it was probably used as "alps" (i. e., high-lying pastures) by the Romanish inhabitants of the lower valleys. This view is supported by (among other things) the existence of place-names of Latin origin, side by side with others which are certainly Teutonic. The original arrangement of the houses in some of the villages makes it it even probable that there was a Romanish population, though small in numbers, already in occupation of Davos at the time these German colonists settled here; for, whereas the houses of the Germans are scattered far and wide over the bottom and slopes of the valley, there were at Davos-Platz and Dorf, even in early times, groups of houses, with the dwellings built close to one another, as is the case in Romanish villages. However this may be, it is certain that about the middle of the 13th. century, twelve German families from Valais were settled in the Davos valley by the Baron of Vaz, a powerful Rhaetian dynast of those days. These colonists enjoyed greater freedom than the remainder of the population. A deed bearing date 1289 ensured to the Ammann (magistrate or bailiff) Wilhelm, and his associates, the estate at Davos as perpetual hereditary fief in return for a moderate ground-rent and the obligation of military service. The little colony retained its German speech and customs, although surrounded by a Romance population. It seems to have increased rapidly, though the in-

crease was perhaps partly due to the immigration of other families from Valais.

The first warlike feat of the Davosers is reported in the year 1325. The Bishop of Chur was at feud with Baron Donat of Vaz. Episcopal troops came over the Scaletta from the Engadine in order to join the Bishop's main army not far from the confluence of the Davos Landwasser with the Albula. In the Dischma, however, they were opposed by the Davosers under the command of Lucas Guler; but it seems that the latter did not succeed in their attempt to prevent the enemy from passing through the valley.

In the fifteenth century Davos became the centre of a peasant federation which was destined to attain historic importance. The last scion of the powerful house of the Earls of Toggenburg (to whom Davos, with other Rhaetian valleys, fell after the Barons of Vatz had died out), left at his death in 1436 a will which provoked quarrels as to inheritance; whereupon the deputies of the various Toggenburg possessions in Rhaetia assembled at Davos and formed the Federation of the Ten Courts *(Zehngerichtenbund)*. They promised to afford each other mutual help in defence of their rights, and not to allow themselves to be separated from one another by any change of overlordship. They also agreed upon stipulations which laid the foundation of a system of federal law. Davos became the seat of the federation, and the chief magistrate or bailiff at Davos came to occupy that position in relation to the territory of the whole federation. Through the union of the Federation of the Ten Courts with the two other Rhaetian federations, the "*Gotteshausbund*" and the "*Grauer Bund*" (Grey Federation), the *Zehngerichtenbund* placed itself in so strong a position that its communes were able to retain their rights, even when towards the end of the fifteenth century they

where transferred by purchase to the house of Austria. — Under Austrian lordship, the mining industry, which had already for some time been carried on at Davos, reached its culmination. Lead and silver, iron and copper were mined, and, in the Sertig Valley, gold as well, but only in very small quantities. The industry was carried on, with temporary interruptions, down to the middle of the nineteenth century, when it had to be relinquished owing to the lack of wood for fuel. Shafts, and remains of the old timbering may be found even at the present day in the ravine of the "Züge", on the Silberberg (Silver Mountain).

In the Swabian War (1499) the "Bündners"* fought on the side of the Confederates against Austria. In the Davos Rathaus a flag is still shown which is said to have been captured at the bloody battle on the Calven.

At an early date, in the year 1528, the Reformation found its way into Davos. The House of Austria put no difficulties in its way. At the time of the Counter-Reformation, however, it sought to lay hands on the religious and political freedom of its Rhaetian possessions, in order to secure to itself the command of the Alpine passes, for which at that time the great powers of Europe were struggling. Davos played a not unimportant part in the diplomatic warfare of those days. The great powers courted the favour of its leading families; the ambassadors of all nations walked in and out of the Rathaus at Davos and distributed their money with full hands, in order to secure the help of the three federations; and the land fell in this way into mischievous entanglements. The Prättigau and Davos became involved in sanguinary battles with Austria. In 1622, Davos-Platz and Davos-Dorf were plundered by Austrian

* The "Bündners": that is, the Leaguers. The inhabitants of the Grisons still call themselves by this name.

troops, and in part destroyed by fire; and, in spite of several successful feats of arms, the inhabitants of both valleys were eventually compelled, in 1639, to submit themselves to the Austrians. But in the year 1649 they purchased their independence from Austria by a payment of 96,000 Gulden, an amount which according to the present value of money is equivalent to nearly £ 28,000. By this sacrifice, doubly hard for a community which had been devastated by war and plague, Davos and its neighbouring communes laid the foundation of their successful development.

During these troublesome times, however, Davos had forfeited a good deal of its political importance. It remained, it is true, the seat of the federal government, but from henceforward it was not necessary that the Landammann should be a Davoser. Still, several Davos families which had attained the rank of nobility, such as the Guler, the Beeli, the Buol, and the Sprecher families, continued to be held in high esteem abroad. Davosers were not seldom found holding high military positions or occupying posts as ambassadors at foreign courts.

The fine hall in the Rathaus at Davos-Platz still remains as a witness of the importance which Davos once enjoyed. Its panelling dates from the best period of the Renaissance. Unfortunately the valuable painted glass, which once ornamented its windows, has to a large extent been destroyed. The missing portions have been filled in with the coats of arms of the most important noble families of the neighbourhood. The hall has recently been restored with great care and artistic taste, so that it is one of the finest relics of the kind in the Canton of the Grisons.

From the middle of the sixteenth century the history of Davos has been interwoven more and more, first of all with that of the three federations, and, from the beginning of

the nineteenth century, with that of the Swiss Confederation. Events of historical importance have not since those early days happened at Davos.

It was a hard life that the old Davosers led in their high-lying valley. They had to fight a never-ending battle with the forces of nature as displayed in the high mountains. It was necessary to wrest meadow and pasture from the primeval forest, and, when this was done, the population had still to defend themselves from the avalanches and landslips that threatened them from the tree-cleared ravines. They had also to protect their cattle from the bears and wolves, which were still by no means rare in the dense woods. Even to the present day a number of bears' and wolves' heads may be seen fastened under the gable of the Rathaus, trophies of a now remote past.

Of great interest from the point of view of the history of civilisation in these parts, is the Davos *Landbuch* (literally, Land-Book, codex), a collection of the laws in force in the district. This *Landbuch* shows us that law and order, discipline and morality, were upheld by the authorities with no faltering hand. The severe provisions against fighting and other forms of violence make it evident, however, that the tendency to such excesses was very marked. From 1700 to 1760 there occurred on the average six serious altercations a year, and it not altogether seldom happened that women were participators. Severe regulations were also made concerning dancing, which amusement led to all sorts of unseemliness. Drunkenness was comparatively rare, and criminal cases were still rarer. Down into the ninteenth century, Sunday was very strictly observed. It was forbidden to carry an agricultural implement or any other burden on a Sunday, and those who neglected to attend church were first reprimanded and then punished. Education was in a

very bad way until well on in the nineteenth century. A report drawn up by Landammann Valaer, and dated 1806, says that even the head school at Platz was never open for more than five months in the year, and that the teacher's salary did not amount to more than a hundred gulden. In the side-valleys of the Dischma and the Sertig the pay was so small that it was difficult to find anyone to accept the post. "Our people", says the report, "will positively not consent to give anything out of their own pockets or subscribe to a fund for the children. Everybody complains about the bad schools, but nobody will contribute towards their improvement. Truth to tell, the school arrangements are by no means praiseworthy. In addition to other disorders, there is this, that all the children commit their lessons to memory aloud, and at times there is such a noise that you cannot hear yourself speak". There was moreover in those days nothing better to be found in the mountain districts, or even in the plains. Poverty was very rare at Davos. Most of the inhabitants enjoyed a good competence. "All the more burdensome", says the same report, "are the beggars who come to us from other parts, principally from the inner jurisdiction of Klosters, whence they often come in troops, and go begging around the whole district in the most barefaced manner. Many families here give away far more bread and other food than they eat".

Until the middle of the nineteenth century, the greater part of the Davos population, which numbered at most 1800 souls, made their living by keeping and breeding cattle. Some corn, principally barley, was also grown, especially in the lower part of the valley. Another occupation was the transit of goods over the passes by means of pack horses and mules. This brought in good money, but also cost many a life. The trade in Veltliner wine was also profitable.

Many Davosers went abroad as confectioners, to work in cafés, or as shop assistants; others took military service in foreign countries. Valaer's report of 1805 estimates the number of Davosers living abroad at 250. The condition of the roads often left a good deal to be desired. Sledges in winter were preferred to the small mountain-carts in summer. Those who had no horses, put young oxen in harness. When there was a heavy fall of snow, all the male inhabitants from fourteen to seventy years of age were required to assist in clearing a way through. As soon as the snow ceased to fall, the bells in all the churches called the men out to clear the ways. In the same manner, twice during the summer the inhabitants turned out in common to repair the ways and bridges. Until 1856 postal communication between Davos and Chur was very deficient. Two messengers went, alternately, twice a week with a mountain-cart through the Prättigau. They left letters at a certain house in each village, whence they were forwarded to their address as opportunity served, or were fetched. In the forties the construction of a road through the Prättigau was begun, but it was not completed in the Upper Prättigau until 1856. This was still the only good road by which Davos was connected with the outside world, when, about the year 1865, a new era dawned for this remote mountain-valley.

On November 8th., 1853, Dr. Alexander Spengler, a native of Mannheim, had come to Davos in order to take over the arduous duties of District Doctor. Owing to his having taken part in the Revolution in Baden he had been obliged to exchange his native country for Switzerland, and the study of law, which he had carried on at Heidelberg, for that of medicine. During his practice as a doctor at Davos he had noticed that pulmonary tuberculosis was

extremely rare in the district, although the housing of the population left much to be desired. On the other hand he not unfrequently saw that native Davosers who had gone abroad to follow the calling of confectioners and café waiters, etc., spending their days in damp workshops or smoky cafés, and getting only a few hours rest at night, not infrequently returned consumptive to their home-valley, in spite of their powerful constitutions. To his astonishment, they recovered very quickly, and many regained full health and strength. Even the cold of the high-mountain winter did their diseased lungs no harm, but rather promoted their recovery. Although Dr. Spengler had until then shared the opinion that only a mild southern climate was capable of affording alleviation to the consumptive, he could not shut his eyes to the fact that the air of Davos had a favourable influence on lung complaints of a tubercular nature. To this fact he called the attention of Dr. Meyer-Ahrens, a balneologist who about this time visited Davos. Dr. Meyer-Ahrens afterwards wrote, in his "Balneologischer Wanderungen": When I was on a visit to Davos in 1862, Spengler, the doctor there, told me his experience of the climate of Davos and the complaints which are to be found there, and drew my attention to the marked success of a stay at Davos in cases of not too advanced chronic tuberculosis. He had at that time already recommended a visit to Davos for tubercular patients, in winter as well as in summer.

By means of this notice the attention of patients and doctors was directed to Davos. In addition to a few holiday-makers, sufferers from pulmonary complaints now began to come to Davos, at first, however, only in the summer months. A decisive event in the development of the resort was the arrival of the two first winter visitors. In February, 1865, two consumptives invalids, who had in vain sought

recovery at Görbersdorf, came to Davos: Dr. Fr. Unger, from Saxony, and a North-German bookseller, by name Hugo Richter*. Seeing that both of them, as well as other invalids who were induced by them to come over from Görbersdorf, derived very considerable benefit from the climate, the two doctors joined forces in an attempt to establish Davos as a health-resort. Few of the existing inns offered accommodation for patients. In addition to the old Rathaus, which from time immemorial has served as a hostel, there was only the Hotel Strela, which was erected at the beginning of the sixties for summer holiday visitors, and was then much smaller than it is at present. In the year 1867, Dr. Spengler, in conjunction with a few Davosers, began the building of the Curhaus, which was to afford accommodation for about 50 visitors. In the following year a Dutchman, Willem Jan Holsboer brought his wife, already hopelessly ill, to Davos. Although she died soon after her arrival, her husband remained here. He had recognised the fact that the little health-resort had a great future in store. He therefore joined forces with Dr. Spengler and took over the management of the Curhaus, just then completed. In Holsboer the resort had found the man who, with unerring insight and untiring activity, deterred by no difficulty, directed the affairs, not only of his own establishment, but also of the whole health-resort, ever and again in the right direction.

The difficulties with which in those days a high-mountain resort for consumptives had to struggle, were by no means small. First and foremost the prejudices of the medical world had to be overcome. In the year 1869,

* In the year 1890 these first winter visitors celebrated, in full health and strength, the twenty-fifth anniversary of their arrival at Davos. Dr. Unger died in 1893. Herr Richter is still alive and active.

Dr. Spengler published a pamphlet entitled (in German): "The District of Davos as Health-resort for Pulmonary Consumption". In this little book he sought to open up a way for new views concerning the treatment of the complaint. His statements concerning the success of the high-mountain treatment met with a very sceptical reception. People had formerly read that mountaineers in the Andes had bled from nose and ears at an altitude of 17,000 feet, and they concluded that at an elevation of 5200 feet lung patients must be subject to hæmmorrhages. What was feared above all, however, was the injurious effect of the cold. The preface to the second edition of Dr. Spengler's pamphlet, which in 1889 was published in unaltered form as a contribution to the history of the health-resort, describes the doubts which prevailed when the book was originally published. "It is true", we read, "that Dr. Brehmer of Görbersdorf had broken fresh ground with a new method of treating lung complaints; but to get consumptive patients to spend not only the summer, but also the winter, on the high mountains, more than 5000 feet above the level of the sea, and to hold out to them the hope of cure, appeared at that time, almost to everybody, as an absurdity. The dogma that cold is the worst foe of weak lungs was still much too firmly rooted. In medical circles, therefore, the book met with a none too friendly reception. The author was ridiculed, or his endeavour to induce consumptives to come up into the mountains, was declared to be criminal".

In spite of all this, however, the truth prevailed. The patients themselves, more even than the doctors, did good service for the infant health-resort. Almost all of them induced companions in suffering, whom they had met at other health-resorts, to come to Davos. In the preface to the booklet from which we have just quoted, we read

further: "All the more favourably was the pamphlet received by the lung patients who had sought in vain for a cure in the summer resorts of the north and the winter resorts of the south. These soon learnt to appreciate the advantages of the mountain climate, and, while a large section of the medical world continued to subject the high mountain theory to the most depreciative criticism, high mountain practice gained undeniable success. Clear-sighted medical authorities, such as Weber in London, Biermer at Zurich, and Liebermeister at Basle, had already declared themselves in favour of the high-mountain treatment, and the number of visitors to Davos increased year by year".

Only too great, on the other hand, were the hopes which the invalids sometimes placed in the Davos air. Patients came out in the last stages of the disease, and expected the curative power of the mountain air to work wonders for them. And invalids who were only slightly ill not infrequently felt that they had been deceived when they discovered that even at Davos a diseased lung could not be healed in a few weeks.

Difficulties of another kind grew out of the primitive conditions of the health-resort itself. Those who to-day know the "town" of Davos, with all its comforts, can only with difficulty form an idea of the exertions which were at first required to make life bearable for lung patients in a remote mountain valley, to say nothing at all of providing the comforts which they had found in the large health-resorts of the south. Not every invalid was able to accept the conditions in good humour. How is it possible, it was asked, to make a health-resort out of this snow-hole? Snow three or four feet deep made it, indeed, very difficult to take open-air exercise in winter. In the narrow part of the road where the snow had been worn smooth by the one-horse

sleighs, visitors were continually coming in conflict with the drivers. They were obliged to wear gaiters reaching almost up to the thighs, because they might at any moment have to step into the deep snow on either side the worn track, in order to get out of the way of a sledge. Heavy lace-up boots, well oiled, were, in addition to the gaiters, among the most important requirements of a Davos visitor. Even in summer, paths and seats were wanting, and many a visitor did a public service by having a seat put up in the woods. Everything that the visitor wanted he had to get sent up from the lowlands; for there was only one little shop in all Davos, and that was in a gloomy wooden shed opposite the Lion Inn *(Gasthaus zum Löwen)*. As a second or even a third shop was opened, people said jokingly, "Davos is going to be an important town some day!" And when in the little room of the Post Inn *(Wirtschaft zur Post)* a barrel of dubious Prättigau beer was exhibited, this was an event which set the whole place in excitement. What efforts it cost to secure tolerable walking in rainy weather, what wonderful machines were invented to water the roads, to make the snow hard and firm on the roadways, or to broaden the track worn down by the sleighs, how long it took to overcome a host of difficulties great and small — of all this, no one who did not live through that early period can form any idea.

But the resort grew. In the year 1868 the newly constructed post-road over the Flüela Pass, nearly 7900 feet high, was opened, affording communication with the Lower Engadine; and in 1872 the Landwasser Road was completed, which leads through the ravine of the "Züge" to the centre of the Canton and to Chur.

In the summer of 1870 there were already a goodly number of visitors at Davos. The Hotel zur Post at Davos-

Platz was opened; an old manor house at Dorf, which had formerly belonged to the Sprecher family, was transformed into the Hotel Seehof, and the Hotel Flüela was built; in Platz a beginning was made with the building of the Schweizerhof and the Hotel Rhätia. By the end of June all the rooms that were in any way habitable, even in the peasants' houses, had been let, and many visitors were unable to find accommodation. When the telegraph brought the news that France had declared war against Germany, many German visitors were obliged to leave immediately, and it looked as if Davos were on the verge of being depopulated; but the very next day all the rooms were again occupied, many visitors who had been staying in the neighbourhood of Davos, waiting until a room should become vacant, having put in an appearance.

In winter, at any rate, there was room enough. That season was still regarded with a certain amount of distrust. However, about seventy visitors had spent the preceding winter at Davos, and their account of the climate was so attractive that the number of winter visitors considerably increased during the next few years.

The infant health-resort had to fight not only against the scepticism of the doctors and the difficulties arising from its remote situation, but also against the destructive forces of nature. On August 26th., 1870, in consequence of a thunderstorm, during which great quantities of hail fell on the western mountain-chain, veritable avalanches of mud and stones were brought down the Gugger-Tobel and Alberti-Tobel, covering the meadows far and wide. From the present Villa Bandli to the Hospital, almost the whole of the valley down to the Landwasser was covered to a depth of three or four feet with the rubble brought down by the Alberti torrent. In many places there were great blocks of

Davos in Winter.

stone nine or ten feet square. The Guggerbach brought down less rubble, but for some time Hotel Strela seemed to be seriously in danger, and in the Curhaus garden and on the meadow behind Haus Schwabe (which now also belongs to the Curhaus garden) considerable masses of mud and stone were deposited, and the Poststrasse was also covered. In order to prevent the repetition of such catastrophes, the Gugger and Alberti torrents were embanked, and barriers were built at great cost in each ravine. These have proved efficacious: for the past 35 years these two torrents have done no more serious damage. Where once was the stone wilderness of the Alberti "Rüfe",* stands today an extensive quarter of the health-resort.

A similar occurrence, caused by a cloud burst in the Flüela Valley, took place on July 16th., 1874. The valley river tore away almost all the bridges, and damaged several mountain-huts; the bed of the Flüela stream was filled with rubble, so that on entering the main valley it overflowed its banks and poured itself into the Davos Lake. A great barrier which was erected soon afterwards, rather less than a quarter of a mile up the valley, has formed the beautiful Flüela Waterfall, now for many years a favourite turning-point in the walks of Davos visitors.

But the resort was threatened by fire as well as by water. The Curhaus was considerably enlarged as early as the year 1871. It was filled with guests to the very roof on January 22nd., 1872, when at about midnight a fire broke out and reduced the fine structure completely to ashes. The visitors were accommodated in some new buildings which were not intended to be occupied until the summer, though

* "Rüfe" is the name given in German Switzerland to the above described avalanches of mud and stones brought down by the mountain torrents.

they were almost finished. Thanks to the energy of Herr Holsboer, the manager, a company was soon formed, financed to a large extent at Basle, and in a short time a new building rose from the foundations of the old one.

The resources of the health-resort were severely taxed at the beginning of the winter of 1874. The old Davosers had watched this development of Davos into a winter health-resort with not a little shaking of the head. They agreed that it might work pretty well in an ordinary winter; but a severe winter with sudden, heavy snowfall, like that of the year 1817, for example, would put a tragic end to any such health-resort. A winter of this kind came in 1874. Until the middle of November splendid autumn weather prevailed. There was still no trace of snow in the valley. Then, on November 17th., it began to snow, and it snowed three days and three nights without a break, with the result that, when the sky cleared, about six feet of snow lay upon the ground. Between Davos-Platz and Frauenkirch two stables were carried away by avalanches, but the cattle were for the most part got out of the ruins uninjured. Enormous avalanches fell also in the Züge. For several days Davos was cut off from all communication. The last post from Landquart — the railway from Landquart to Davos did not then exist — arrived at Klosters on the evening of the 18th., and worked its way up to Davos by dint of an eight hours fight with the elements, arriving at half past one in the morning. It was quite impossible to get from Platz to Dorf. The storm-bell called out the men of Davos-Platz to cut a way through the snow. With a number of horses, one of which was stifled in the snow, they worked their way through to Dorf and brought the post safely to Platz on the 19th. When the snowstorm ceased, the road was cleared as far as Klosters, at which place the Davos work-

men, with their horses and sledges, arrived on the 22nd., returning to Davos in the evening with the post sleigh which, though it had left Landquart on the 19th., had only got as far as Klosters. It was also necessary to dig out paths to remote farm-houses and to huts on the high-lying pastures, in order to render assistance to snowed-up inhabitants. Two persons, for example, were shut away on the Schatzalp; two others, an old man of eighty and his daughter, at Dürrenboden, at the very end of the Dischma Valley; and a family urgently in need of the necessities of life was crying for help from the Flüela Hospice. The Landwasser Road was so buried under avalanches that it was well on into December before it could be used for traffic. There was, however, no lack of provisions in the Davos hotels, although for several days no meat could be sent up from the lowlands. At Hotel Strela, however, the wood supply gave out, it having been intended to fetch the winter stock from the forest as soon as the first snow had fallen; but an old shed was pulled down, and this furnished the necessary fuel for the stoves. It was some time before all the roads, paths, terraces, etc., were got into tolerable order again, as most of the labourers were busily employed in removing the enormous quantities of snow from the roofs. But the resort had come through the ordeal: a snowstorm such as had not been experienced since 1817 had failed to place it in a serious dilemma. The future could now be faced with confidence; for, the more the resort grew, the greater would be the resources upon which it could call in battling with the hostile forces of nature.

But really it seemed as if all these forces had conspired together against the men who had undertaken this unheard-of task of establishing a health-resort for lung patients on the high mountains. Hardly had the resort and

its immediate neighbourhood been placed in safety by the erection of costly barriers across the torrents, when fresh difficulties arose. The principal stream in the valley, the Landwasser, threatened to turn the whole level area of the valley between Davos-Dorf and Frauenkirch into a swamp. In the course of centuries the bed of the Landwasser had been gradually raised by the rubble brought down by its tributaries from the Flüela and Dischma Valleys. The stream had at many points been dammed in, but this did not prevent its overflowing when the snows melted in early summer on the higher mountains, thus turning a considerable area of the valley into a lake. Shortly before the year 1880 it was decided to embank the Landwasser for a distance of 2 3/4 miles. A Committee of five was appointed to take this big piece of work in hand. The Swiss Confederation voted a grant of 30 per cent of the cost of construction. The work was begun in the spring of 1883 and finished in the autumn of 1885. The cost amounted to rather more than Fr. 280,000, and payment was arranged to extend over a period of ten years. Since then the Landwasser has flowed in a sufficiently broad and deep bed; the meadows through which it runs have considerably increased in value, and the danger of the lower portion of the valley being converted into a swamp — a condition of things which must have immensely damaged Davos as a health-resort — has been completely obviated.

While the work of embanking the Landwasser was in progress, the fact that Davos and its neighbourhood possesses an unusually dry climate was brought to light in a most striking manner. The Chief Engineer of the Canton had proposed a bottom width of five metres for the bed of the river, on the assumption that a flow of 40 cubic metres of water per second was the maximum at high water.

His specification was objected to, however, by the Department of the Confederal Chief Inspector of Works. The latter felt compelled to regard 100 cubic metres as the maximum. It was thereupon proved to the Department, on the basis of the meteorological observations, that Davos, together with the Engadine and the Münster Valley, formed a zone of quite exceptionally low rainfall. The conviction was arrived at that the five metre breadth would suffice, and so the Davosers were saved considerable expense. As a matter of fact, the bed of the Landwasser has proved itself up to the present time to be quite adequate, and was so even during the exceptional high-water of the summer of 1890.

Let us now return to the circumstances of the health resort during the early years of its existence. The *treatment of the patients* was in the main the same as that practised in Dr. Brehmer's institution at Görbersdorf. The patients were kept as much as possible in the open air; medicine was seldom prescribed. "With regard to being in the open air", wrote Dr. A. Spengler in the preface to the pamphlet from which we have already quoted, "we observed in those first years, especially during the winter, much greater precaution than afterwards. Any one who remembers what prejudices had to be combated in those days with respect to fresh air, especially winter and night air, will understand this. Many patients brought the then much used respirator with them and thought it necessary to wear it even on cool days in summer. At the outset, in order to avoid any possible imprudence, we instructed patients to retire to their rooms a considerable time before sunset. Only gradually, as we became convinced that it did them no harm to be out in the cool air, did we get into the way of allowing patients to take a walk after the sun had gone down. Those who have had no experience of those days can form no idea of

how the patients then fought shy of the open air, and with what difficulty they were convinced that they could with impunity sleep with their bedroom windows open. If to-day the beneficial influence of fresh air is generally recognised, it may well be that the experience gained in this respect here among the mountains, may have contributed something to the result."

It was always held to be of great importance that the patients should be given right and proper food. A nourishing and easily digested diet was prescribed, with an abundant but not excessive use of milk. Veltliner wine, which contains but little acid, and which, owing to the tannin in it, suits the stomach well, was also ordered for most patients. The cognac-drinking which for some years threatened to become the fashion among Davos invalids, was never prescribed by the Davos doctors, but was a custom imported from some of the lowland health-resorts, and opposed by the doctors here. On the other hand, and following in the footsteps of Görbersdorf, special emphasis was laid on the douche and the cold rub-down. After acclimatisation, all light cases, if there was nothing to contra-indicate it, were treated with the douche. That is to say, the patient was submitted to a shower of cold water (of from 4—5 degrees C.) falling under considerable pressure. The douche was, however, always given by the doctor himself, and did not last more than 45 seconds.

In light cases more exercise was in general allowed than is permitted nowadays; but it is not correct to say that it was sought to cure consumption at Davos mainly by mountaineering. "With regard to the mountain-climbing which many patients liked to undertake during the summer months, it was always emphasised that too much rest was in all circumstances less injurious than too much exercise,

and that when the fever was always increased by exercise, *absolute* rest was necessary". So we read in the above-mentioned preface to Spengler's pamphlet; and in the pamphlet itself he says: "The aim is, to enable the patient to be as much as possible in the open air, and, always with due regard to the stage of the complaint, to take every advantage of the curative factors of the rarefied air, by means of rest, gentle exercise on the level, continual exercise in climbing, and even daily, systematically carried-out mountain tours.... Rest and exercise are to be taken in due proportion; for, in general, abundance of rest is much better than too much exercise". But it must be admitted that among the patients themselves there was a tendency to overdo the exercise. By climbing up the mountains, many a one endeavoured to prove to himself or to his fellow-sufferers that he was one of the light cases, or was already cured. When he saw that visitors who had come out for preventive rather then curative purposes, or patients who were already nearly cured, climbed up to the Schatzalp or the Strela Pass, he wanted to do the same thing; and many a good cure was spoiled by this nonsensical mountaineering. A good many invalids thought that the one thing needful was that they should live on the mountains, and because they could with impunity do many things here which would have had disastrous consequences in the lowlands, they thought they might do anything.

The "lying-out cure", which to-day has become general, was then unknown, or was resorted to only in bad cases. It was seldom that patients with high temperatures lay for weeks together in bed: they were taken out on to the balconies in front of their rooms, and lay there all day long, wrapped in warm rugs when the weather was bad. In winter most of the patients sat on the terraces exposed to

the full heat of the sun, the head protected by a straw hat or by a sunshade fixed up so as to shade the upper part of the body as well.

Year by year new hotels and other houses intended for invalids were built. There was really no end to the building activity played. With regard to the number of visitors frequenting Davos in summer and winter respectively, a surprising change took place about the middle of the seventies. Whereas up till that time the preponderance of visitors was in summer, from now onwards there were more people here in winter. In the middle of August, 1875, there were about 260 visitors staying at Davos; at the end of December, about 350; and later on the proportion became still more in favour of winter. Not that the cure had been so much more successful in winter than in summer; but many patients contented themselves with spending a few weeks during the summer at a home health-resort, in order to economise their means for the winter, being unable to spend this season of the year at home. Others, who were not thus circumscribed by their means, preferred, for the sake of the change, to spend the summer in health-resorts which offered more entertainment. And then it soon came to be thought that a health-resort at which lung-patients stayed in winter must be very hot in summer, — a view which, so far as it relates to Davos, is of course without foundation. The Davos climate is midway between that of the Upper and the Lower Engadine, the summer resort district par excellence.

For a long time many invalid visitors scrupled about spending the spring, the snow-melting period, at Davos. They left as early as the end of March, in order to escape the supposed dangers of the thaw. The snow-melting was, in fact, thoroughly unpleasant as long as the maintenance

of the roads was as bad as it was in the seventies; but there was no actual element of danger in it. In the course of time this dread of the thaw has disappeared. Whereas in earlier years the resort was well-nigh empty from April till June, there are now more than 2000 visitors present in Davos at one and the same time in the month of April, and it is not until June that the total sinks to about 1500. It rises again, however, almost immediately, and, in September, one of the most beautiful months of the twelve, shows once more a temporary decrease.

Up till the year 1875 the visiting public of Davos was composed principally of Germans, Swiss and Dutch. Then the resort began to be better known in England. An English lady, Mrs. MacMorland, who had come quite early to Davos, rendered good service to the resort by means of an excellent little book entitled "Davos, By One who Knows it Well." The English author, J. A. Symonds, who settled at Davos, also helped to make it known in England by his articles on life in the Swiss highlands. A. W. Waters, one of the earliest visitors to Davos, also did useful work, chiefly by making and publishing meteorological observations. It was only in the next decade that Davos became known in France, Belguim, Portugal and Russia; and gradually its fame has extended to other countries, to America, and, indeed, over the whole world. Germany and England, however, still continue to send the greatest number of patients. A local census, made as carefully as possible on March 1st., 1882, showed that the number of visitors then staying at Davos was about a thousand — a total which had never up till then been reached, and the attainment of which would not a few years earlier have been deemed possible.

Such prosperity had not, however, been attained with-

out good solid endeavour in all directions. In addition to the hotels and boarding-houses, a good many shops had been erected, and building-yards and workshops of all kinds had sprung into existence.

In other ways, too, efforts were made to supply both the material and the spiritual needs of the visitors.

The Davos Evangelical Invalids' Association (Evangelische Kurgemeinde) was founded as early as the year 1869, with the object of meeting the religious requirements of the German-speaking invalid public. Through its instrumentality, divine service was for thirteen years conducted by an evangelical clergyman in the halls of various hotels, the invalid visitors being as a rule unable to attend the then still unheated and rather primitive local churches. Since 1870 the association has also provided "deaconesses" as nurses for invalids. In the course of years, however, it became more and more difficult to meet all the demands made upon the society in this connection. The Deaconesses' House (Diakonissenhaus), at present called, in honour of its founder, Alexander House, was therefore built in the year 1882, under the presidency of Dr. Alexander Spengler, by means of the voluntary offerings of members and friends of the cause, as well as from the proceeds of charity bazaars. This institute was especially intended for severe cases, and such as wanted special nursing and attention. By gathering the patients in need of nursing into one house, the association hoped to be better able to fulfil the claims made upon it than had up till then been the case with the patients scattered about in various houses, each needing a special nurse. For many years the house also served as a home for the nurses employed in attending out-patients. Some years ago the "Diakonissenhaus" at Berne established a special Home at Davos for the nurses on duty here.

The Chapel of the Evangelical Invalids' Association adjoins the Alexander House, and there since 1883 the pastor of the society has regularly held services in the German language.

Since the same year the English have also possessed their own church at Davos, St. Luke's Church, which forms the centre of the spiritual interests of the English Colony. The cost of the building was defrayed by subscriptions and private donations. For nearly twenty years English nurses have also been stationed in the resort.

As early as 1879 a grateful French visitor founded a Catholic Chapel. When this no longer sufficed, a stately gothic edifice, St. Mary's Church, was built by voluntary subscriptions. Near at hand is St. Joseph's House, which is conducted by Catholic Sisters, who act as nurses both inside and outside the institution.

There is also a church in connection with the Evangelical Home Mission. This is St. Paul's Church, which was built in 1902 by Dr. Langmesser and his wife, who had already worked for the Home Mission since 1891. They also founded a Temperance Hall.

The circumstance that a good many well-educated people were compelled by the state of their health to live for a number years, almost without a break, in this lonely mountain-valley, soon gave birth to an active intellectual life, in which a goodly proportion of the more fluctuating society also took part. It was when the resort was smaller, and the intellectually-allied of all nationalities could meet together more easily than is the case to-day, that this feature of the social life of the place was at its meridian. We remember how the poet, Wilhelm Jordan, who during the eighties recited a number of songs from his "Nibelungen", was astonished at the intellectual activity of the

resort. "Davos is permeated with intellectuality!" he exclaimed. The house of Dr. A. Spengler, who was magnificiently hospitable, was one stimulating centre of social life. In the English Colony the house of J. A. Symonds, the author, was another such centre.

Amateur concerts were given in the very earliest years of the existence of the health-resort, and chiefly for the benefit of charitable objects. In 1874 a visitor delivered some lectures on music at the Hotel Rhätia, and in many winters an active musical life was developed.

In the year 1881 a large Concert Hall and Theatre, with fully equipped stage, was built as an addition to the Curhaus, and there theatrical performances are given three times a week during the greater part of the year. Since 1890, lectures on literary, historical, scientific, ethical and religious subjects have been given regularly in the large hall of the Curhaus.

The Hotel Belvedere, the largest of the English Hotels, has since 1892 possessed a similar Assembly Room. It is the centre of English social life, but is also used for social purposes by visitors of other nationalities. The first orchestra instituted for the benefit of visitors, played at Davos in the summer of 1874. Since then the resort has had sometimes one, sometimes two orchestras, playing in the hotels and in the public grounds. In the year 1900 the Curverein took over the maintenance of the orchestra, which is at present composed of about 40 performers. This orchestra gives concerts in the larger rooms at the hotels and in the Assembly Halls, as well as in the open air. The symphony concerts, which take place once a week in winter, are especially popular.

In the year 1886 the English visitors and residents also established a Libray, which at present contains more

than 5000 volumes. It is housed in a building of its own, and is the largest English subscription library on the Continent. The Evangelical Invalids' Association also has a public library, which is at the disposal of all visitors free of charge. Since 1898 the Russians have also had their own library.

Davos possesses an especially valuable institution in the Friedericianum School-Sanatorium, which was founded in 1878 by a German schoolmaster, Dr. Hermann Perthes, Privy Councillor, of Carlsruhe. While staying at Davos for the benefit of his health, he had noticed that many young people, who had come to Davos as a preventive measure, or were only slightly ill, lived in idleness, and thus wasted the choicest years of their youth. He decided to give them an opportunity of continuing their studies here, paying at the same time due attention to the re-establishment of their health. He therefore founded the Fredericianum School-Sanatorium, which from small beginnings has developed into a large institution. When Perthes left Davos, he gave the conduct of the establishment into the hands of his teachers, U. Schaarschmidt, at present a Gymnasium Director in Saxony, and H. Mühlhausser, Privy Councillor. Since 1890 it has been under the sole leadership of the latter. The institution, which possesses two large buildings with spacious terraces and playgrounds, affords accommodation for about 50 pupils, who have the benefit of highly individualised treatment in accordance with the orders of the house-doctor. The instruction, which is given by a large staff of teachers, corresponds with the curriculum of the German Gymnasia and Realschulen (Grammar Schools, and Public Schools without classical instruction). About 30 day-scholars also participate in the instruction. The number of hours during which each schol-

ar has to study, is regulated by the doctor, and the lessons are so spread over the day that the most favourable hours can be devoted to open-air life. Every year some of the pupils most successfully pass the highly appreciated German *Abiturientenexamen**, which is especially valued in medical and educational circles.

A second school-sanatorium is the Girls' Boarding School conducted by the Fräulein Dickes, in conjunction with which is also a school for day-scholars. Like the Fridericianum, it endeavours to give intellectual and moral education while at the same time paying the fullest attention to health. This institution has also been in existence for more than five-and-twenty years.

If complaints were once made of the insufficiency of the Davos district schools, we can at any rate say now that during the last fifty years very much indeed has been done to raise the standard of education. All the local communes have erected fine new schools. The School-house at Davos-Platz is really a splendid building, such as would be a credit to any large town. In addition to the Elementary School, with its nine classes, there is a Higher Grade School (Realschule) with two classes. There is no lack of opportunity for learning at Davos. A good many teachers, of both sexes, have settled in the town, and give lessons in most of the European languages, in music, painting, and many other subjects.

A few words may be said here about the Davos press. As early as 1872 a Davos visitor published an illustrated journal ("Fliegende Blätter"), which treated in a humorous manner the life of the invalid visitor at Davos. The present German weekly, the "Davoser Blätter", has been

* The final examination qualifying for matriculation at the universities, etc.

published since 1873. For a good many years this paper, which also contains the Visitors' List, had to be printed out of the resort. The first number printed at Davos appeared on March 15th., 1881. Since 1894 a weekly journal "The Courier", has appeared in the English language, and since 1898 there has been a French paper, "Le Courrier de Davos". In the year 1882 the "Wochenblatt für die Landschaft Davos" was established, which, under the title of "Davoser Zeitung", now appears three times a week. Another local paper, the "Davoser Anzeiger", is also published.

Of quite exceptional value have been the labours which the Curverein has undertaken in the public interest, and its history is pratically identical with that of the resort. Of this organisation we must next give a detailed account.

The fact that-the whole district of Davos, with its seven villages, formed for local government purposes but one single commune, presented from the beginning no little difficulty in connection with the prosperous development of the health-resort. Only two of these villages, Platz and Dorf, had a direct interest in its prosperity. In consequence of this, the financial means of the whole commune of Davos could not be employed for the benefit of the health-resort. Everything must be done by private individuals, or by associations and organisations formed by them. As early as 1871, five of the leading men in the place met together in order to form an Inprovements Association ("Verschönerungsverein"). This Association set itself the task of improving the roads in the resort, and of making sidewalks and pavements and paths through the woods. Although the Davos hotel-keepers and other members of the association made considerable financial sacrifices, only little could at first be accomplished. Year by year fresh

sacrifices were necessary, even when the custom of asking a small weekly tax from visitors had been initiated. In the year 1875 the Improvements Association changed its name to "Curverein Davos-Platz". In the course of years this association has developed into what it is to-day, an organisation in which are concentrated all the interests of the health-resort and which is its general representative. In the year 1884 a Curverein was also founded at Davos-Dorf, and in 1900 the two associations amalgamated and became the "Curverein Davos". This organisation is a kind of "general servant" for Davos. One by one the following tasks have fallen to its lot:

1. Maintenance of the roads and of the paths through the woods; watering the same in summer and keeping them open in winter; the laying down and maintenance of side-walks and pavements; the laying of new, and the improvement of the existing roads and pathways.
2. Electric street lighting.
3. The omnibus service (so-called "tram") between Platz and Dorf.
4. The official disinfection of visitors' rooms.
5. The scavenging arrangements.
6. Management of the official Meteorological Offices' and publication of the Davos Weather Chart.
7. Maintenance of the Orchestra.
8. Management of the general Drainage System.
9. Management of the Water Supply.
10. Management of the Landwasser Regulation Scheme.
11. Management of the Skating Rink.
12. The official Registration of Visitors and the control of the Cur-tax.

Davos, with the Seehorn

Davos in the Year 1867

W. J. Holsboer

Dr. Alex. Spengler

The laying down of *sidewalks* and *pavements* within the resort was begun as early as 1871. They were extended year by year, and are now to be found along all streets and roads in the resort, reaching to a length of nearly three miles. Footpaths have also been made through the woods on the western side of the valley: the lower and upper paths (Waldwege), the Schatzalp path, a way from the lower path to Davos-Dorf, and the Rüti way. Similar footpaths have also been made on the eastern side: the path to the Waldhaus and into the Dischma, the path to Clavadel, the path to the Flüela Waterfall, and that on the eastern side of the lake. An excellent footpath has also been laid along the Landwasser embankment from Davos-Platz to Frauenkirch. Most of these paths are plentifully provided with seats. Along all of them, so far as they do not pass through woods, tree-planting has been in progress since 1899. These trees, however, will only afford shade in days yet to come. Inside the health-resort itself the Curverein has also laid out and planted numerous small grounds, among them a little garden containing Alpine plants, which flourish exceedingly. On all hands it has been found that, if only a little care is taken, a much larger variety of growth can be cultivated on the high mountains than was formerly supposed possible. In many gardens deciduous trees and shrubs have afforded an abundance of shade for some years past, whereas recourse was formerly had to awnings and garden-tents. But here too it was only after the experience of long years that success was achieved. In former times thousands of young trees were lost through not being properly treated. The worst enemy of young trees is the autumn snow, which often snaps off the finest branches while they are still in full leaf. In spite of all the difficulties, however, the complaint heard in former years, that no shade was to be

found in the neighbourhood of the hotels, has now become groundless.

To provide the resort with an adequate supply of good water, cost a great deal of money. The water-pipes and wells originally in existence soon proved insufficient. As early as 1873 a spring on the western side of the valley was enclosed and its water laid on to the various houses in the resort. In the year 1884 a large main, about three miles long, was laid down, to bring the water from several excellent springs in the Flüela Valley into Davos. In 1897 the springs were newly built-in. Whereas, according to general opinion, 150 litres of water daily per head of the population is sufficient, Davos has at its disposal more than ten times this quantity of water per head of the native and visiting population, and this is the case even in winter, when water is of course comparatively scarce.

Not less important than the water supply is the drainage of the resort. The provision of a public sewerage system was begun in 1882, and completed for the whole of Davos-Platz during the course of the following year. In 1887 it was carried through to Davos-Dorf, and in 1902 extended to the extreme upper end of the valley, as far as the German Sanatorium, close to Wolfgang. Thanks to the superabundance of water and the excellent flushing arrangements in the houses, all impurities are carried outside the town by means of sewerage extending throughout the resort. The cost of this installation amounted to nearly Fr. 230,000. A system of hydrants covering the whole of the resort makes it possible to keep the roads free from dust in summer. House and street refuse is taken outside the town every day in covered carts. Large laundries, fitted up on the most modern principles, undertake the cleaning and disinfecting of linen.

A local bye-law passed on May 13th., 1900, provides for the *official disinfection* of all rooms occupied by tuberculous invalids. Every room which has been occupied by a tuberculous patient can only be handed over for the use of another person after the room itself and all its contents (furniture, beds, clothes, personal and bed linen), have been not only thoroughly cleaned, but also disinfected on the lines laid down by the Davos Medical Association. Notice of the departure of an invalid must be given to the Curverein by the landlord within 24 hours of the room becoming vacant. All rooms must be disinfected unless a medical dispensation is produced. Rooms used by tourists or commercial travellers are exempted from this regulation. The disinfection is carried out by a staff appointed for the purpose by the Curverein. The charge for the disinfection of a room is Fr. 7, or when two or more rooms leading into one another, as in a flat, are disinfected at the same time, Fr. 5 each room. Every lung patient is required to carry a pocket spittoon. There is also a district bye-law forbidding invalids, under penalty of fine, to spit on the floors, pavements or sidewalks, roads or footpaths.

In the year 1896 an Isolation Hospital was built, to which all persons suffering from acute infectious complaints must be conveyed immediately after the nature of the illness has been made known by a doctor, except in cases where the District Doctor gives a dispensation.

Gas Works on a small scale, which supplied the Curhaus and other hotels, were put up as early as 1874; but in consequence of the cost of coal, which had to be carted to Davos, the price of gas was too high to permit of its use becoming general. In the year 1885 the Hotel Buol introduced *electric light*, the Hotel

Rhätia following suit the next year. The necessary current was also supplied for a number of arc lamps for lighting the streets. But unfortunately the street lighting was regularly lacking in winter, just when it was most needed. In the year 1893 a company on co-operative lines was formed for the purpose of supplying the whole resort with electric light at a low cost. Electric plant was laid down on a large scale at Frauenkirch and Glaris, and the force of the Sertig torrent and of the Landwasser was utilised for the production of electricity. The undertaking has been a complete success. To-day all the houses in the resort are lit by electricity. The street lighting is effected by means of electric arc-lamps of 192 normal candle power. A difficult piece of work, and one which added much to the appearance of the resort, was the improvement of the "Obergasse", which was carried out by the Curverein between 1897 and 1902.

The need had for long been felt of some better means of communication with Davos than that provided by the Post Office in the shape of diligence and sleigh. The seven hours journey by road from Landquart to Davos was extremely fatiguing for invalids, and the carriage of the necessities of life and of building material was also very expensive. When, in 1886, W. J. Holsboer brought forward the project of a narrow-gauge railway, the scheme met with a cordial reception on the part of the inhabitants of Davos, although doubts were entertained whether it could be realised. However, the Initiative Committee, consisting of Messrs. W. J. Holsboer, Bühler (member of the National Council), Lietha (District President) and Government Councillors Salzgeber and Walser, went very energetically to work. They succeeded in interesting the Prättigau communes in the project. The 12th. of Sep-

tember, 1886, was a memorable day, not only for the health-resort of Davos, but also for the whole Canton of the Grisons. On this day a vote was taken in the communes of the Prättigau and at Davos on the proposal that the land, water-power, wood, stone, gravel and sand necessary for the construction of the railway should be provided free of cost and that, in addition, a subvention in ready money should be made to the extent of half a million francs, of which four-fifths were to be provided by the commune of Davos. At this latter place the proposal was accepted by a large majority, after a long debate at a very largely attended communal meeting held in the church at Platz, and soon telegram after telegram came in with favourable news from the communes in the Prättigau, these being greeted with loud shouts of rejoicing by a large and excitedly expectant crowd which assembled in the open space in front of the Rathaus.

On October 15th. of the same year the concession plans, which had been worked out by Herr C. Wetzel, an engineer who had for some years been a visitor to Davos, together with the necessary accompanying documents, were completed, and handed over to the Swiss Confederal Council by an Executive Committee, with Holsboer again at its head; and on April 22nd., 1887, the concession for the construction and working of the railway was granted. On February 7th., 1888, the owners of the concession formed a company for the construction and working of this railway, fulfilling all the requirements of the Confederal Council with respect to its finances. Most valuable services were rendered in connection with the financing of the undertaking by Herr F. Riggenbach, banker, of Basle, Chairman of the Board of Directors of the Curhaus Company at Davos, who for over twenty

years had been a frequent visitor to Davos for the sake of his health.

The construction of the line, which is 31 miles in length, was begun on March 12th., 1888. On October 9th., 1889, it was opened for traffic as far as Klosters, and on July 21st. the following year the section between Klosters and Davos was also opened. It was a dull, rainy day, with the mountain-tops hidden among the clouds; but the resort was gaily decorated for the occasion, and at the banquet, which was held in the large dining-hall at the Curhaus, joy and confidence reigned supreme. Davos was now certain of a great future. The railway, which cost close upon 7 ½ million francs, was built by Philipp Holzman & Co., of Frankfort, and Jacob Mast. In cash and kind, the line had cost Davos nearly 1,200,000 francs. It very soon proved itself to be not only very solidly constructed, but also a profitable undertaking. Holsboer's forecast turned out to be quite correct, and the consequence was that when he drew up a plan for a Grisons railway system which should connect the principal valleys of the Canton, he received the confidence of the whole population. Whereas up to then all cantonal railway projects had come to nought, the construction of the line from Landquart to Chur and Thusis, and then of the Albula line from Thusis into the Engadine, and the branch from Reichenau to Ilanz, was within a few years successfully accomplished. Holsboer had originally sketched out a Scaletta railway to afford direct communication between Davos and the Engadine, but in the interests of Chur, the capital town, and of the central parts of the Canton, he found it necessary to give up the project, and to accept the Albula instead of the Scaletta route. He did not, however, live to see its completion. He died on June 8th., 1898, after having assisted during

his last days in making arrangements for the building of the Schatzalp Sanatorium. Not Davos alone, but also the whole Canton of the Grisons, will long hold in thankful memory this highly-gifted man, who laboured more than anyone else for the construction of the cantonal railway system.

The Landquart and Davos Railway has a gauge of one meter; it is an adhesion railway throughout; its maximum gradient is 45 %o, and the minimum radius of the curves 100 metres. The carriages are provided with steam-heating and lighted by electricity. Special invalid carriages are at the disposal of those who are severely ill. In winter the line is kept open during heavy snowfalls by means of snowploughs, with the result that even in the worst of weather the trains are not so often late as those in the lowlands. Only once, in February, 1892, — before the company possessed proper snowploughs, and sufficient experience had been acquired of the all-round requirements of the line, — was it necessary to suspend the traffic on account of a tremendous snowfall. Finally, however, there fell upon the railway line an avalanche which all the snowploughs in the world would have been unable to cope with.

It may interest the reader to hear some particulars about this event. The health-resort of Davos experienced at that time such days as it had never before known. At the beginning of February there were already over 31 inches of snow on the ground. Then, on the 5th., with a föhn wind blowing, it began to snow. On the 7th. the fall was so great that one could see the depth of snow on the ground increasing from hour to hour. Within the borders of the resort the sledges used for flattening down the snow were kept going without intermission. On the railway the snowplough was

working day and night; but it was soon only with difficulty that it could fulfil its task, for at that time there was, in several places where the line passed through cuttings, not sufficient room to dispose of the snow. Thanks to the strenuous exertions of the Working Manager, Schucan, and his staff, the section from Landquart to Klosters was kept open, but on that between Klosters and Davos the traffic gradually came to a standstill. On the evening of February 6th. two locomotives and a carriage got through to Davos-Platz. On the following morning (Sunday) a whole train came in, and on the same morning two engines got down from Davos to Klosters. Then the traffic came to a stop. On Sunday afternoon thirty one-horse sledges left Davos-Platz to clear the way along the post-road to Klosters, in order to fetch the mails. With these they returned towards midnight. All day Sunday hundreds of workmen were employed in clearing the approaches to the houses in the resort, and in shovelling the snow off the roofs. Whereas in 1874, on the occasion of the great snowfall already described, the thoroughfares soon became impassable, owing to the absence of any proper snow-rollers and other appliances, it was possible in the present instance, owing to the improved means employed, to keep the roads in such good order that many visitors walked about in the heavy snowstorm enjoying the wonderful spectacle. The resort presented a most remarkable appearance: enormous ramparts of snow surrounded the houses, with narrow ways cut through; the gardens were so filled up with great masses of snow that the tops of the trees showed above its surface like so many shrubs. At one place in Davos-Platz, where after the snowfall of 1874 a little less than six feet of snow had been measured — in Dr. Spengler's comparatively sheltered garden — the snow lay on Sunday afternoon two met-

res (6 feet 7in.) high, and it still continued to snow without intermission, and in a perfect calm. There was some rain during the night, so that the snow got hard and sank down considerably; but it soon began to snow again, and on Monday afternoon it measured, in the spot already mentioned, nearly 7 feet.

On Saturday avalanches (the so-called "Staublawinen" or "dust" avalanches) began to fall. In the Dischma they came down one after another. On Sunday morning the ice on the lake, nearly three feet thick, was broken in by an avalanche which rushed down from the Hellbach ravine and over the post-road. On the Drusatscha-Alp, half an hour's walk from Wolfgang, several empty sheds used for storing hay were torn away by an avalanche which came down from the Hörnli. This avalanche, following the indentation worn out by the Drusatscha stream, descended almost to the lake, shaving off, below the Drusatscha-Alp, a large number of larches and fir-trees, and covering the railway line for a distance of more than a hundred yards and to a height of rather more than 26 feet. A confused mass of tree-trunks, some of them 30 inches in diameter, reached and settled upon the line itself. On Monday morning shortly before 11 o'clock an avalanche which broke loose from the Dörfliberg, fell upon the post-road. In its descent it caught up some stalls, and its lowest-reaching offshoot only stopped short in front of an uninhabited house at the upper end of Davos-Dorf. Indeed, part of it forced its way in through the kitchen window, and a quantity of hay from one of the demolished stalls was deposited in the garden belonging to this same house. In one of the stalls there had been a boy and nine head of cattle. The storm-bell rang out from the church tower; a large number of men were soon on the spot, and succeeded in getting out the

boy and six of the cows, the three others being killed. On the same day an empty stall was swept away near Clavadel, and not far from Laret several more stalls were also destroyed by an avalanche. In the Dischma a stall containing ten head of cattle was demolished, nine of the animals being killed.

On Monday morning a violent storm set in from the north, and buried the streets in snow. On this one day, if we recollect aright, the post failed to arrive; but the Davosers worked the whole day long opening up the road to Klosters, so that the next day the post could run again. On the other hand, certain sections of the railway line were buried beneath enormous drifts of snow, and telegraphic communication was for a short time interrupted in every direction. Traffic over the Flüela Pass, which connects Davos with the Engadine, was stopped for several days, and the Landwasser road was blocked by large avalanches which fell in the ravine of the "Züge".

From Monday evening it snowed only slightly; on Tuesday evening the sky again became clear; and it then began to be very cold. The health-resort of Davos had come out of the ordeal with flying colours. Except that a few letters and newspapers arrived a day late, everything had proceeded with the customary regularity. On Sunday evening there was the usual theatrical performance at the Curhaus, on Monday afternoon the literary lecture, and in the evening a soiree for the benefit of the Catholic Church and a meeting of the Alpine Club. The Skating Rink, it is true, was compelled to close its doors for a few days, and the toboggan races arranged by the English visitors for February 9th. and 11th., had to be postponed. The visitors had followed with interest, and even with enthusiam, a nature spectacle such as they had never before

witnessed. Seldom, indeed, had conversation at table or in the public rooms been so animated as during these few days. The English sportsmen, who had been disappointed of their toboggan races, began to shovel snow as if they had a wager on with the workmen, and many even helped to clear the roofs. It was reported in German newspapers that the Davos visitors had been compelled to shovel away snow, as otherwise it could not have been kept under control. In consequence of this an invalid visitor received a serious letter from his anxious relatives, asking if he also had been pressed into service as a snow-shoveller.

The following figures will give some idea of the quantity of snow that fell in the Upper Prättigau and at Davos. In places where there had been neither drift nor slip, the following depths of snow were measured by railway officials on February 9th.: Küblis 1 metre 20, Serneus 1 metre 50, Klosters- Dörfli 1 metre 85, Klosters-Platz 2 metres 40, Laret 2 metres 63, Davos-Platz 1 metre 93. According to the report of the Meteorological Office, 1 metre 46 of snow fell at Davos-Platz between the 5th. and 9th. of February. It should be borne in mind that before this the snow had already lain 80 centimetres (31.50 inches) high.

It cost no little labour to clear the railway, buried as it had been by the drifting snow of Monday. Two hundred and fifty men had to shovel away snow for a week. The last train ran on February 7th. By the evening of the 14th. the whole section was cleared; a few goods trains ran on the 15th., and the regular service was resumed on the 16th. This one snowfall cost the railway considerably over Fr. 20,000. On the following day Davos visitors went by train in large numbers in order to see the masses of snow along the line. The journey was, indeed, extremely interesting. In the wood along by the Seehorn great ramparts

of snow towered up on either side. In the clearing below the Drusatscha-Alp, where the line takes a turn to the north, the train travelled between the great masses of the already-mentioned avalanche. On either side one could see the sawn-off tree-trunks peeping out of the snow, which seemed to be at its highest between Lower and Upper Laret. In places it stood up like a perpendicular wall, only a foot from the windows, and towering high above the carriages. The station buildings at Laret had almost entirely disappeared beneath the inconceivable masses of snow that had been heaped up all around. Near Klosters, too, the snow lay from three to four metres high, and in some places higher. There were still many workmen busily engaged along the line. As the train travelled on, one saw them standing on the ramparts of snow high above the carriages, or in numerous niches which they had hewn out in the wall of snow. The next summer many improvements were made on the line in order to prevent the accumulation of snow in the cuttings, and a better type of snowplough was also procured. In spite of repeated heavy snowfalls, there has been no further interruption of the train service.

The impulse given by the railway to the prosperity of Davos surpassed expectations. Building activity assumed proportions such as had never hitherto been reached. Several quite new quarters sprang into existence; Platz and Dorf grew into one, and the number of visitors increased enormously. Whereas in the year 1889 the number was 6872, it increased in the following year to 10,167, in the year 1895 to 13,220, and in the year 1905 to 20,042.

As we have been speaking of means of communication, we may for the sake of completeness mention that since 1883 there has been an hourly omnibus service between Platz and Dorf. This was originally maintained by some

of the hotel proprietors, but was taken over by the Curverein in 1900. Since 1905 the omnibus has been replaced in the summer months by a motor-car.

Towards the end of the eighties it seemed as if the number of visitors had come to a standstill. The total of 6830 persons in 1886, sank in 1887 to 6325 and in 1888 to 6208. This was doubtless due to the fact that under the influence of certain bacteriological publications the fear of infection by tubercle bacilli had taken hold of a large number of people. It was thought that it must be dangerous to stay at Davos, where so many lung patients were gathered together. In the lowlands some wonderful rumours got into circulation. Among other things, it was said that the native population of Davos, which had once been almost completely free from consumption, was, on account of living with the invalid visitors, falling more and more a prey to this complaint, and that the nurses and the servants at the hotels also became consumptive. These rumours probably originated in this way: Very many lung patients who had at first lived at Davos as visitors, settled down permanently and opened businesses, and consumptive servants were often advised to seek a situation at Davos. Many of these servants, who generally endeavoured to hide their illness, had after a short time to be sent away again, as they were unable to do their work. Not a few of them thereupon tried to revenge themselves by relating in the lowlands that they had become consumptive at Davos. It is, however, a fact that of all the nurses who have been on active service at Davos, not one has ever contracted lung disease.

Doctors and patients alike soon became convinced that there was no greater danger of infection at Davos than anywhere else. They saw that scrupulous cleanliness was observed in almost all houses, and that, in particular, the in-

valids' linen and their sputum were most carefully dealt with. In the year 1889 the number of visitors went up again to 6872, and in the following year still higher. But, in any case, the fear of infection, which in other places also blossomed out into strange enough forms, has ever since then kept many people away from Davos.

Extremely valuable service was rendered to the resort some years later by a visitor who was already severely ill when he arrived, — Dr. W. Aebi, of Interlaken. He took advantage of being in Davos during the winter of 1896—7 to gather statistical material relating to the prevalence of pulmonary tuberculosis among Davosers before and after the place came to be a health-resort. His researches, based on documentary evidence extending over a period of fifty years (1847—1896), have shown that there has been no increase in the mortality from tuberculosis since Davos became a health-resort, in spite of the fact that not a few Davos burgesses have married settlers, and not always healthy ones, whose descendants also figure as burgesses.

Unfortunately, the worthy doctor was not cured by the Davos air: he died, even before the results of his investigations had been published in the "Korrespondenzblatt für Schweizer Aerzte" (Jahrgang 1898, Nr. 2).

We have mentioned earlier in this article the efforts which are nowadays made to meet the danger of infection.

Having spoken of the period of exaggerated fear of bacilli, we must not forget another memorable period in the life of our health-resort: those restless weeks which brought the earliest announcements made by Koch, the discoverer of the tubercle bacillus, concerning tuberculin. It was in November, 1890, that the news went the round

of all the papers that the famous scientist had discovered a remedy for tuberculosis, and that at Berlin many sufferers had already been treated with it. The excitement which this news occasioned among visitors at Davos was indescribable. Many an invalid left at once for Berlin, though the majority were detained by the news which immediately followed, that the Berlin institution in which the tuberculin treatment was being carried out, was already overfilled. People hardly knew how to wait for the arrival of the first tiny bottles of tuberculin. It was in vain that the doctors pointed out that the patients were hoping for much more than Koch had promised. They thought that a few injections of tuberculin would make them well again. "By Christmas", they said, "we shall be at home once more; it is all over with Davos; the mountain climate has become superfluous; grass and moss will soon be growing on the roofs of the hotels". The tuberculin came. The inoculations began at Davos earlier than at most health-resorts, Koch having been persuaded to send on a few of the little bottles in order to damp the excitement which from day to day still increased. It is, unfortunately, not necessary to relate what ensued: it is known to everybody. The hopes of the invalid public were not fulfilled. Bitter disappointment spread all around. Many people still continued to build their hopes on later effects of the injections; but soon there were but few invalids who would listen to anything about tuberculin. The tuberculin treatment has, however, never completely fallen into disuse at Davos, and for some years past it has again been considerably practised by many doctors. But it is no part of our task to enter further into such matters.

Another factor, in addition to the railway, which contributed to the rapid growth of the health-resort, was the

establishment of sanatoria at Davos. Up till the year 1890 Davos had been an "open health-resort", i. e., the patients lived in hotels and boarding-houses, which were not under direct medical supervision. Each invalid had a doctor and lived according to his orders — or did not. The only exceptions were the school-sanatoria and the "Diakonissenhaus"; but there were no "closed institutions" (sanatoria), such as had for some time existed in Germany. Now, however, a new phase began in the development of the health-resort. Dr. K. Turban established his *Sanatorium* at Davos, the first institution of the kind on the high mountains. Under his leadership the establishment was a great success, especially as the innovation was supported by the approval of doctors away, who much preferred treatment in a sanatorium to that in hotels. In the other houses in the resort the "lying out cure" as carried on in the sanatoria was also introduced. Instead of the open verandas and balconies, on which the invalids had hitherto spent their time, roofed shelters for the cure ("Liegehallen") were now build, or, where they already existed, enlarged. The success of Dr. Turban's Sanatorium soon brought about the establishment of numerous other sanatoria, and many an hotel also underwent the transformation. The largest of all is the Schatzalp Sanatorium. Built five years ago by the Curhaus shareholders, it is under the direction of Dr. Lucius Spengler (a son of Dr. A. Spengler) and Dr. Neumann. In connection with it, not only was a road constructed up to the Schatzalp, but an electric funicular railway was also built, by means of which the inhabitants of the health-resort are able with much greater ease to visit this charming spot and the heights surrounding it, and to enjoy the magnificent views which they afford. This railway, which was opened in the year 1900, is 2356 feet long;

Davos, with the Schiahorn

Davos-Dorf

In the "Stille"

the lower station, which is situated in the centre of the resort, is 5120, and the upper station 6102 feet, above the level of the sea. The initial gradient of 36 % soon changes into one of 47.4 %. The line has on the average been used by over 40,000 persons yearly.

Since the introduction of the sanatorium at Davos, *sanatoria* for *the indigent* or for the less well to do, have been established. Quite early in the history of the health-resort, efforts were initiated for making the advantages of the mountain air accessible to the impecunious. In the year 1868 an "Association for the Support of Needy Lung Patients" was founded, which had for its object to support those invalid visitors who lacked means to complete their cure. From 1874 the association caused collecting-boxes to go the round of the tables at the hotels, in addition to which charity bazaars, concerts, theatricals, and so forth, were held for the benefit of the funds, with the result that until about ten years ago it had a considerable income, amounting in some years to more than Fr. 20,000. Many hundreds of visitors of every nation and religious persuasion, who had already been at Davos at least three months at their own expense, have been supported by this association. But as the resort became larger, the various nationalities began to look after their own invalids, and the income of the international organisation began to decrease considerably. A Franco-Belgian and a Swiss association for supporting impecunious lung patients were founded; the English established a Home for their less well-to-do fellow-countrymen, and the Dutch and Germans began to collect money for the building of sanatoria for lung patients in need of assistance.

As long ago as 1897 the Dutch rented a house at Davos-Platz for the reception of less well-to-do invalids,

and in the late autumn of 1901 the institution moved into a newly-built sanatorium, for which in particular the Dutch Vice-Consul Plantenga, an old visitor, had energetically and successfully worked. In the year 1896 the Basle Public Benefit Society erected a stately Sanatorium at the entrance to the Flüela Valley for the poorer invalids of the town and canton of Basle. In the autumn of 1901 the splendid German Sanatorium for less well-to-do patients, at Wolfgang, opened its doors. This institution owes its existence mainly to the self-sacrificing labours of the German Consul, U. H. Ch. Burchard, who for many years had been resident at Davos. Next year the English are also to begin building a similar establishment, for which considerable sums of money have already been collected.

A Hospital for the inhabitants of the district, for employees, servants and workpeople, was erected in 1887. Its realisation was largely due to the labours of Dr. W. Beeli, who was first of all District Doctor and then practised among the visiting population.

A Medical Association has been in existence since 1891. Among its other activities, it has set itself the special task of advising with regard to the sanitary and hygienic measures taken in the interests of the health-resort, working always in harmony with the Curverein.

The Davos Public Interests Association (Verkehrsverein) is another organisation which claims our attention. As its name indicates, its object is to maintain and forward the public interests of the health-resort, and this it does particularly by means of suitable publication and advertisement, and by affording in all sorts of ways general information concerning Davos. It is this association which publishes the visitors' journals: "The Courier", the "Davoser-Blätter" and the "Courrier de Davos".

With regard to the numerous other clubs and associations that exist at Davos (Gymnastic Club, Vocal Associations, German Club, Chess Club, and the various sporting clubs), we cannot here enter into particulars. We must, however, mention the Fire Brigade, which has been in existence since 1881, and which for a number of years has been excellently organised and equipped. Practices are frequently held, but it is fortunately seldom that a more serious call is made for its services.

Side by side with the invalids, there have always been a large number of healthy visitors at Davos. Many patients who had to make up their minds to years of residence here, brought out their families with them, and not a few built their own houses. Moreover, the number of visitors coming out for the sake of sport has increased year by year. These form nowadays a section of the community to a large extent separate and distinct from the invalid visitors, and stay at hotels especially set apart for tourists and sport people. In the year 1886 the Davos Branch of the Swiss Alpine Club was founded, which to-day numbers more than a hundred members. By the making and marking of footpaths, the Club has rendered the neighbouring passes and mountains more easily accessible; it has built Club Huts on the Silvretta and on Piz Kesch, and, by holding courses of instruction, has trained some good mountain guides.

The English Colony has shown a special preference for *tobogganing*. Runs have been constructed on the slopes, and since 1883 races have regularly been held, in which the English compete (not only among themselves, but also with the rising generation of the natives and with sport-lovers of other nationalities) for the prizes which are offered for superior speed and skill. The most important of these races take place in January or February every year

on the piece of road between Laret and Klosters. "Grüne Bödeli", the start, once known only to Davos carters, is now a spot often talked of in England. Ladies also are passionately fond of this form of winter enjoyment. Whole books have been written about the sport as it is practised here and at other winter resorts in Switzerland.

Ski-Running, too, has become very popular at Davos. The passes and peaks in the neighbourhood are frequently climbed by ski-runners. Davos has also had the honour of being chosen as the scene (in 1907) of the principal ski meeting in all Switzerland. — First and foremost among the sports, however, is *skating*. There was a small skating rink as long ago as the winter of 1869—70. Skating clubs were soon formed, and these constructed larger rinks or practised the sport on the Davos Lake, as long as it remained free of snow. Since 1887 the maintenance of the Skating Rink has been the affair of the Curverein, which has laid out a rink with an area of 31,000 square yards. At the north end is a spacious pavilion with a restaurant, cloak-rooms, and sunny veranda for the spectators. Skating is to be had on this rink for fully four months, and, in many years, longer. Besides the speed and figure skating, certain games are played on the ice by English visitors. There are, for example, the Scotch game of curling, and Bandy, or Ice Hockey. Matches are arranged both by the Bandy Club and the Curling Club. Bandy matches are played not only against the members of the St. Moritz Club (in the Engadine), but also with Berlin and other foreign clubs.

Of quite special interest, however, are the annual International Skating Competitions, which were inaugurated in 1891 and have since 1893—1894 become events of the first importance in the sport world, attracting a numerous

public from far and near. The finest exponents of speed and figure skating in Germany, Austria, Holland, Norway, and England, as well as of North America, have taken part in these gatherings. Thunders of applause greet the victor who has perhaps created a new record. Several of the existing world's records were made on the Skating Rink at Davos.

An excellently arranged *Shooting Gallery* (heated in winter) for guns and revolvers, has been at the disposal of visitors since 1884. Its construction was largely due to the efforts of Herr C. Demmer, the proprietor of the Hotel d'Angleterre.

The cultivation of these summer and winter sports at Davos has often, especially in medical circles, given rise to fears that lung patients may be led into taking part in amusements incompatible with a successful cure. In early years, when the health-resort was still small, there may have been some justification for such fears. In those days the whole of the visitors to Davos formed but one social circle, and the doctors found it difficult to prevent invalids in search of amusement from doing as those did who were hale and hearty. With the growth of the resort, however, the visitors divided of their own accord into various groups. Those who are staying in Davos for the sake of their lungs, come but little in contact with sportsmen. As a rule, the life prescribed them by the doctor would in itself be sufficient to prevent this. Invalid visitors have to content themselves with watching the sports from the balcony or from the Promenade. There is no lack, however, of such amusements as are consistent with the cure. Many busy themselves with collecting postage stamps, with drawing and painting, in summer with botanising, while at all times of the year amateur photography forms one of the staple amusements.

Measures are also taken at Davos to provide that the nightly quietude shall commence early, even in houses frequented entirely by healthy visitors. For the past seventeen years it has been the law that all restaurants and public-houses must close punctually at half-past ten, otherwise host and guest are alike subject to a heavy penalty. This law has proved to be most salutary.

With the growth of the health-resort one question has come forward with ever greater urgency — the so-called *smoke question.* On fine winter days, when not a breath of air is stirring, there gathers over the resort in the early morning hours a haze of smoke which only begins to disappear when the sun has overtopped the mountains. For many years past the Curverein has busied itself with the smoke question, having appointed a special committee to investigate it. And now the speedy solution of this difficulty also comes in sight. In October, 1904, a joint-stock Gas company with a working capital of Fr. 800,000, was formed, based, like the Electric Supply Company, on co-operative principles; and in the autumn of 1905 large Gas works were erected at Laret, about five miles from Davos-Platz, in order to supply gas at a low price for the workshops, kitchens, and stoves of the whole health-resort; so that we many look forward to the smoke being reduced to a minimum and the whole smoke question speedily put out of existence. The works are capable of producing 5000 cubic metres of gas a day.

And here we must bring our history of the health-resort of Davos to an end. Many a memorable event, many a noteworthy work, has remained unnoticed or has been only lightly touched upon. And many a man, too, who has done valuable service for the resort, remains unmentioned. We could not go further into detail, having, indeed, already exceeded the space allotted to us.

Davos-Platz and Davos-Dorf, whose central points were once separated by a distance of about a mile and a half, now form one common whole, and the health-resort has also extended itself into other parts of the valley. Below Wolfgang, by the Lake, and at Clavadel, offshoots of the resort have sprung up. And also at Laret, Frauenkirch, in the Sertig Valley, at Glaris and at Monstein, there are hotels or Curhäuser, which are at least frequented by summer visitors. When the railway line from Davos-Platz to Filisur is once built, by means of which Davos will be connected with the Albula Railway, and towards the construction of which Davos has already voted a million francs, new groups of houses are sure to spring up in the southern parts of the valley.

In the year 1905 there were staying at Davos:

6953 Germans	698	Austrians and Hungarians
2379 English		
5488 Swiss	667	Portuguese, Spaniards, Italians and Greeks
1055 French		
275 Belgians	130	Danes, Swedes and Norwegians
498 Dutch		
1281 Russians	384	Americans
	234	Belonging to other Nationalities

In all 20,042 persons.

The figures do not include the strangers who have permanently settled down at Davos for the benefit of their health. These number some hundreds. There are now several foreign consulates at Davos: H. B. M. Consulate, the Imperial German Consulate, the Portuguese Vice-Consulate for the Grisons, and the Dutch Vice-Consulate for the Grisons and Ticino.

Of the men who created the health-resort and guided its early developments, many are no longer alive. Holsboer's death we have already chronicled; Dr. Unger died on April 5th., 1893, three years after he had gone back to Germany; Dr. A. Spengler died on January 11th., 1901, a few years after he had retired from practice. Other men have stepped into their places, who work with a sure hand for the further development of the resort, and spare no pains to promote that "health-town" of Davos which was once Holsboer's ever-present ideal, and which to-day is an accomplished fact. Among those who labour for the improvement of the resort, not a few came originally as invalid visitors. They have succeeded in regaining their health, or at least a capacity for work: Davos has become their second home, and they now feel it their duty and their desire to place their health and strength at the disposal of the resort. We may truthfully say, therefore, that the place does not owe its vigorous and successful development merely to the speculative and money-making spirit, but that, from its earliest beginnings until the present day, unselfish, self-sacrificing feelings have contributed to its prosperity.

We close with some words from the preface to the second edition of Dr. A. Spengler's pamphlet:

"Anyone who saw the embryonic health-resort of Davos at the time when the author sent this little book out into the world, and sees it again now, will be unable to resist the conviction forced upon him, that the development of Davos, unique in the history of health-resorts, cannot be a mere stroke of fortune, but that it is an irresistible proof of the very great importance which in the treatment of pulmonary consumption must be attributed to the high mountain climate".

HISTORICAL:
II. THE ENGLISH COLONY AT DAVOS

BY W. G. LOCKETT.

The attempt which is made in the present article to sketch the history of the English Colony at Davos, should be considered as supplementary to the foregoing history of Davos as commune and health-resort.

"You apologise for the number of dates. I bless you for your copious use of them", wrote one whose name will figure largely in our story (a446). We venture to connect this article with its predecessor by means of a few dates and other data.

Dr. Alexander Spengler came to Davos in the year 1853. In 1862 Dr. Meyer-Ahrens published ("Beilage zur Deutschen Klinik", 1862, p.82) an abstract of what Dr. Spengler had told him about Davos and its climate. The attention of the medical world was thus for the first time publicly drawn to Davos. The Valley had already been frequented in summer by a small number of holiday-makers who had discovered its charms. A few consumptive patients now began to appear in summer; but, although Dr. Spengler had recommended Davos for winter as well as for summer residence, it was not until 1865 that any patients were found brave enough to face an Alpine winter. For a time there were only two such visitors. But their example was quickly followed by others, and they had six companions

during that same winter. Next winter the number rose to 20, in the winter of 1868—69 to about 30, and the next two winters to about 55 (b5). In summer, of course, the number of visitors was much larger. The greatest number present at one and the same time has been given as 70 in 1870, 90 in 1871, 120 in 1872, 200 in 1873, 300 in 1874, 400 in 1875 (c53). These figures are perhaps rather too high; but they give at any rate an approximate idea of the size and growth of the resort during those earliest years. Up till 1875 the principal season was in summer. In that year, for the first time, there were more winter than summer visitors.

The first genuine Englisman to spend a winter in Davos was Mr. Arthur William Waters. It was a most fortunate circumstance that the first Englishman to winter here was a gentleman of Mr. Waters' scientific training and ability; for he was also the first person to make independent meteorological observations at Davos, and his writings helped to make the place known both at home and abroad. When Mr. Waters came to Davos in the summer of 1869 he had no intention of remaining during the winter. As that season drew near, however, he made up his mind to stay, though many of his friends regarded it as a foolish and wicked experiment. But foolish and wicked as it seemed, it was quite successful; so successful, indeed, that Mr. Waters stayed the next winter as well.* Two winters later the first British family to spend a winter at Davos had

*) Mr. Waters returned to Davos in 1881, and made it his home until 1905. He built himself a villa - Sunny Lea, at Dorf — in 1894—5. — General Haig, by the way, who first came to Davos in 1879, and was a leading member of theEnglish Colony until he left Davos in 1900, built a villa here about 1890. This was afterwards enlarged into the present Dutch Sanatorium. — Several other English residents have since then built or bought their own villas.

settled in. We shall hear more of them very shortly. Indeed, the English visitors must now have increased very rapidy in number; for in 1871 the Colonial and Continental Church Society considered there were enough English people at Davos to make it desirable to send out a Chaplain. Services were accordingly commenced at the Curhaus, but it seems that the commencement was made rather too early; for the Chaplain had to report that there were no English present at the services, what congregation there was being apparently composed of foreigners desirous of obtaining free lessons in English. But the Society was not to be discouraged by the failure of its first attempt. Next year the services were held for six weeks in the summer at the Curhaus, the Hotel Rhätia, the village Church, and the Seehof. The average attendance at these services was 19, but even now these were chiefly foreigners. This was again discouraging, and in 1873 the services were dropped. In 1874, however, the Society returned to the attack; but now the average attendance was even less than in 1872. It was 17, and only seven of these were English. Still, they did not despair. In respect to finances, it is to be noted that during the first five years the offertories amounted to only 13 l. But the Society was convinced that Davos had a future. The Chaplaincy was maintained.

It is difficult for us who are familiar with only the Davos of to-day to form a notion of the Davos of those days. A picture elsewhere in this volume gives us an idea of its outward appearance. Mr. Waters tells us (d2) that in 1869 Davos was "a simple mountain village with two moderately sized hotels". In 1871 there were four hotels at the disposal of invalids, while two others were already being built (b5). In 1869 Davos did not boast a single shop.

Although it would be difficult to say exactly how many

people it takes to form a "colony", we have more than one authority on our side when we say that it was between 1875 and 1877 that there really began to be an English Colony here. Attention had at length been aroused in England, and now "quite a rush of English visitors took place" (e3). The Hotel Belvedere * — then only a third its present size — had been erected in 1875. "This hotel" (said a writer in "Chambers's Journal" in 1880) "was built for English visitors", and this fact alone shows that the English influx had begun. The winter of 1876—7, says another writer (g4), "was the first season when any number of English hibernated in the place. They formed a British Colony in the Hotel Belvedere". Indeed, this hotel at once became the centre of English life at Davos. In 1877 a contributor to "The Scotsman" (May 31st.) said: "I had myself the pleasure of observing conspicuous cures wrought upon countrymen of my own in this house, where the English seemed to have formed a settlement". That the colony could not have been very numerous, however, is evident from the facts that the greatest number of visitors of all nationalities present in Davos at any one time during the years 1875—7 was only about 500, and that whereas the greater part of the English seem to have been amply accommodated in one hotel, the foreign element was able to maintain seven. In an article published in 1878, Mr. John Addington Symonds wrote that "during the past thirteen years" Davos had been transformed from a "mere mountain village into a health-station frequented by nearly one thousand invalids, who pass the winter with every comfort and good accommodation, excellent food, and not a few amusements. The majority ot these visitors are German;

*) The Hotel Buol was built in 1872 (frequented by English since 1878; the Hotel d'Angleterre about 1880 and the Hotel Victoria in 1885.

but Poles, Russians, Belgians, Danes, and a good many English and Americans, may now be found in the colony.... Until quite recently it has been known to few but middle-class Germans; and, if its fame is now spreading more widely, every step it makes is through its own merits." (f 6—7.)

Now, when Mr. Symonds spoke of nearly a thousand invalids being in Davos, he perhaps meant that this number came to the place during the season or the year; for Herr Coester, who we think was inclined to overestimate rather than underestimate, gives the greatest number of visitors present at any one time between June 1st., 1877 and May 31st., 1878, as 560; 700 in 1878—9, and 770 in 1879—80. It was not until 1882—3 that the thousand was reached. At any rate, Mr. Symonds evidently did not consider that there was an English Colony at Davos quite as early as the date which some others have assumed; for, writing ten years or more later, he says that his article in the "Fortnightly Review" (the 1878 article, from which have just quoted) "contributed something, perhaps, towards the foundation of the English Colony at Davos" (f283).

If we look again into the history of the English Church at Davos we find some facts which we think justify the view that there was now (1876—8) really an English Colony in existence at Davos. The fact, for instance, that in 1877 the first steps were taken towards the building of an English Church, is of itself an important indication. — Let us take up the history of the British Chaplaincy at the point where we dropped it (1875). The Hotel Belvedere was, as we have seen, at once recognised as the centre of English life at Davos; all the English services were held there in 1876, and in that year the first winter Chaplain was appointed. The average attendance had increased to 22, and we are

told nothing about foreigners. In 1877 the afternoon service took place at the Curhaus; but after that year all English services were held at the "Belvedere" until the Church was built. The attendance increased year by year. In the summer of 1878 the average number present was 77, and on Christmas-Day, 1881, the morning service was attended by 144 persons.

We fortunately possess a full and interesting account of the Davos of this period, and from the pen of an English writer. In the very year that Mr. Symonds' historic article appeared in the "Fortnightly", a book was published entitled: Davos-Platz: A New Alpine Resort for Sick and Sound in Summer and Winter. By One who Knows it Well".

This is the longest and most complete English book ever written about Davos, and, in our opinion, still in many respects the best. Although published anonymously, it has for many years been no secret that its author was Mrs. MacMorland, her husband, we believe, contributing some portions. — Mr. and Mrs. MacMorland, with their family, came to Davos — "by accident", she tells us (g preface) — on the recommendation of a German doctor at Nürnberg, in June, 1871. They were the first English (or, rather, Scotch) family to remain at Davos for any length of time, and the first to spend a winter here. Strangely enough, theirs was also the first family from Great Britain that stayed at St. Moritz. Passing tourists from England had been there; but that was all. The MacMorlands went to St. Moritz in 1855, travelling by canal and diligence from Zurich. The railway from this latter place had just been begun, being in the hands of English engineers, contractors, and navvies. — When the MacMorlands arrived at Davos there was, of course, no English hotel, and they settled down at the Curhaus — not the present stately building

with its dependent villas, but the original and comparatively small Curhaus which was burnt down in January, 1872. When the "Belvedere" was opened in 1875, they were its first guests, and remained faithful to the hotel for 13 years. In 1877 Mrs. MacMorland published a pamphlet about Davos — also anonymously, as by "One Who Knows it Well". This, as the author herself wrote in the preface to the book published the next year, "did not seem sufficiently comprehensive to do justice to the subject, and now this fuller and, as far as circumstances allowed, complete guide book is offered to the English public." This larger book was written (as its style evinces) with much enthusiasm, and with gratitude for the good service which Davos had rendered to the author in restoring her health. It is very thorough, and written in a light, popular, often humorous style. It gives information and advice to invalids, describes Davos and Davos life in summer and in winter, is the fullest guide to the walks and excursions that is to be found in our language, contains also by far the best account of the Davos flora that exists in English, as well as useful information with respect to its animal and insect life, geology, etc., has the fullest history of the valley accessible to English readers, an interesting chapter on "Present Local Life", and, to conclude with, plenty of "practical hints". The following details of life at Davos in 1878 are drawn entirely from this book.

The lying-out cure, in the strict sense in which we know it now, did not in those days exist. In summer the visitors seem to have spent most of their time in saunterings and excursions, and in sitting about on the terraces, in the woods, and beside the roads and paths. "The English Colony . . . always finds something to do", we are told. "Excursions are constantly planned. Gay parties of

picnickers may often be descried having themselves 'carted' up the lateral valleys. Some again test their walking powers on the various peaks and summits; while others go in for a favourite hobby with select and sympathising friends. A few will, perhaps, try a little equestrian exercise". Rowing on the Lake was also indulged in. There were "two neat little boats" and a "cranky old tub". The eastern shore of the Lake was "a perfect El Dorado" for the organisers of pic-nics. In autumn young people found a suitable outlet for their energies in picking bilberries, whortle-berries and cow-berries.

We remarked at the beginning of the last paragraph that the lying-out cure, as we know it now, had not then been invented. It had, however, a delightful precursor, to which we are introduced in the following terms: "When, as often happens, secret lovers of ease and idleness are sojourning here, the wood above the Hotels Belvedere and Buol presents an almost ludicrous aspect. In every pretty and convenient nook, hammocks are slung from branch to branch, wherein the lazy bipeds *roost*, half fancying themselves members of the feathered tribe, as they gaze sleepily into the tangled anatomy of the fir-branches, while book or sketching-block lies usually within reach, to be seized upon deftly, and with a firm grasp, as soon as the footsteps of a passer-by betray the presence of a possible interrogator.

"About five o'clock groups of these forest-birds are visible, lounging around the rustic restaurant, as they listen for the tingling of bells which heralds the approach of cows from the Strela-Alp. The milk, partaken of *al fresco*, close to the fragrant pine-trees, and with suggestions of aromatic Alpine herbs, tastes doubly as sweet as usual, and there is no difficulty in realising that it is far superior in

John Addington Symonds

Hall in the Rathaus

Ich hanns ardüser diser zit landsdurcher uff davas och bumeister dis hus und habs mit gotts hili glücklich zu endt bracht 1562.

nutritious qualities to the same beverage in the plains. People who have spent their afternoon in the Mattenwald — the wood on the eastern side of the valley — can have the same rural treat at the Waldhaus, whose owner possesses a herd that grazes on the slopes of the Jacobshorn." Such idyllic conditions have long since vanished. Nowadays all our milk comes out of the shining pails brought round in the bright blue carts of the General Milk Supply Company.

Winter life must have been much quieter in those early days before there was any real sport; and yet it was never altogether without its gaieties. People skated, of course — when the lake was available, and that, as all Davosers know, could not have been very often, or for long at a time ; and they "toboggined" (as they spelt it in those days), in a casual sort of way, down the various slopes. But there was no winter sport as we understand it now. It was not until British people came out in sufficient numbers to claim an hotel to themselves and so form a solid colony, that the winter pastimes were (if we may put it that way) taken seriously. This, as we have found, occurred about 1876—7, and in a very short time means were found for the construction of a rink. It is a strange comment upon the comparatively small amount of appreciation which outdoor amusements found among the other nations then represented at Davos, that although the place was known to and frequented by them for more than a decade, a rink had never been dreamt of. "The occasional skating-ground represented by a small reservoir seldom swept, that might be readily crossed in a 'stroke', could hardly lay claim to the title in question, even in the seclusion of Davos. . . . Since its establishment, everybody wonders how it was possible to exist so long without it, for it creates a centre

of attraction not only to the performers but to the spectators also, who promenade up and down or lounge upon the benches, reading newspapers, criticising the skaters, watching flirtations, and laughing heartily at the small misfortunes of beginners" (g41). Tobogganing and tailing were both popular, and the Klosters Road was already chief favourite among the more advanced. The usual practice was to make up parties, lunch at Klosters, and return by private sleigh or the "diligence", the toboggans of course being towed up riderless behind. There seems to have been absolutely no organisation either of skating or tobogganing, and the other winter sports were apparently unknown. The Clubs with their races and competitions belonged to the future, though not a very remote future. The first toboggan race ever held in Switzerland was organised by Mr. Hornblower in 1881—2 on the Klosters Road, and the Toboggan Club was formed in 1883; but the English Skating Club did not come into existence until 1889.

Judging from the description given of the indoor social life of the Engish Colony, it was not essentially different then from what it is now — except that everything was, of course, on a smaller and more primitive scale. In addition to its eight hotels, Davos could only boast about a score of villas. Our English visitors were also further from home. The journey from England generally took three or four days, it being the custom not to travel at night. "People who do not fear to encounter fatigue frequently travel straight through from London to Basle, and in summer the same energy will carry them on to Davos in another long day, though this necessitates a very early start", and one did not reach Davos until nearly ten at night. In winter, however, the traveller was obliged to spend the night at Landquart (or within easy distance by rail), as there was

post" each day, and this left Landquart at 10
ıing Davos at 5 p. m. Letters were delivered
ay after leaving London (g222—4 and 232).
egard to dress, the most notable difference be-
and now (leaving the difference in mere fashions
question) seems to have been that "gouties"
s) had not been introduced. The visitor is told
rong nailed boots and thick gaiters, suitable for
/omen anxious to regain their health must con-
minine weakness of trying "to convince them-
their sensible friends that it is impossible for
ear the weight of heavy shoes and gaiters".
"insert their feet, however, Andalusian, into a
-nailed boots, with plenty of room and to spare
e layer of felt soles. If they prefer, however,
onceal flannel-lined Wellingtons under their
36).
extensive borrowings from a very interesting
ıo doubt have afforded some helpful glimpses
ıvos of those early days.

But an even more powerful pen was now placed at the disposal of Davos. On August 7th., 1877, John Addington Symonds, then 36 years of age, arrived here — also, we may say, "by accident". He had been seriously ill. It was impossible to remain in England. He was in doubt where to go. The Canaries, Australia, and Egypt had been weighed in the balance. Egypt, and a winter in a dahabieh, were finally decided on. Before leaving England, however, Mr. Symonds went up from his home at Clifton to consult Sir William Jenner in London. Sir William told him very gravely that he must not leave England without settling his affairs, and advised him to spend some weeks on the way to Egypt on the high Alps, in order, if possible

to gain a little strength. Now, Mr. Symonds' youngest sister, Mrs. T. H. Green, and her husband, happened at this time to be staying at Davos. They wrote a very favourable account of the place, and, although this was the first time he had ever heard of it, Mr. Symonds decided to go there. He did so, and the place did him good from the very first. "When I found my health improve beyond all expectation, the desire to remain where I was, to let well alone, and to avoid that fatiguing journey to Cairo, came over me. Slung in my hammock among the fir-trees of the forest, watching the August sunlight slant athwart the branches, the squirrels leap from bough to bough above my head, it seemed to me that life itself would not be worth living at the price of perpetual travelling in search of health . . . . Then I informed my good and famous physian in London that I meant to disobey his orders and shut myself up for the next seven months in this snow-bound valley. He replied that 'if I liked to leave my vile body to the Davos doctors that was my affair; he had warned me'" (f282—3).

In what Mr. Symonds afterwards wrote concerning the first days of his residence at Davos, we again get some glimpses of life here and of the methods of cure then in vogue. Dr. Ruedi (of whom we shall hear more later on) saw him the morning after his arrival, and pronounced his case grave. "He gave me directions which I scrupulously followed". For the first three weeks Mr. Symonds sat all day long on a gravel terrace in front of the Hotel Belvedere. Then, as we have seen, he was allowed to do the quite customary hammock cure in the woods, glimpses of which we have already had. "My man-servant took me up in a little carriage, hung a hammock between two pine-trees, carried and placed me in the hammock, and when

the sun came near to setting, fetched me again in the carriage". Many years later he wrote that whenever he passed the place where they used to sling his hammock, a curious sense of reverence came over him, a feeling of the mystery surrounding human life. He seemed then so surely "marked out for gradual declension" that his thoughts assumed "the grey and quiet tone of resignation". He was quite unfit for work. "Nature", he said, "went healthily to sleep in me". But the climate soon began to tell. The first sign of convalescence was a re-awakening of mental energy. He began to write poetry again. By the beginning of September he was allowed to walk a little and to take drives. Then he began to explore the beauties of the valley, walking higher and driving farther. The improvement in his health went steadily on, and he had already begun to like Davos. "In no place where I ever camped out", he wrote in the following February, "have I felt so much at home, so tranquil in spirits, so sane and so contented, as I do here. It was a blessed wind, I think, which blew us hither". (a335).

We have dwelt at some length on the early days of Mr. Symonds' life at Davos, in order to give, in conjunction with what follows concerning him, one typical instance of what Davos has done for hundreds more of our fellow-countrymen. The place undoubtedly gave him many years of life, and without a fairly complete understanding of his condition when he came, the reader would not appreciate the fullness and the extraordinary mental and bodily energy of those precious and productive years which the climate of Davos added to his life.

Mr. Symonds left Davos in April, but was back again by midsummer. It was not long before it became evident that Davos must, for some years at any rate, be his place

of residence. In the summer of 1879 he took a suite of rooms on the second floor of the Hotel Buol. In 1881 he began to build his own house, "Am Hof", into which he moved in September, 1882. On the veranda of this house he wrote all his more important books, and it was his home for the rest of his life. Mr. Symonds died at Rome, during one of his many journeys to Italy, in April, 1893. "Am Hof" was sold by Mrs. Symonds in the summer of 1905.

Here we have no room (nor is there any need) to enter fully into Mr. Symonds' life at Davos: it is fully and charmingly set forth in his book, "Our Life in the Swiss Highlands", and in his biography, which is also to a large extent an autobiography. But there are a few features of his life at Davos which our subject naturally leads us to deal with.

We must in the first place point out that Mr. Symonds' very presence was most effective in drawing the attention of a great many people to the existence and value of Davos. He not only had a very large and influential circle of acquaintances, but was also known to still larger circles as a scholar and an author. It is true that when he arrived at Davos he had not published very much; but from the time he settled down here he poured forth a marvellous variety of valuable literature at a speed positively astonishing when we remember not only that he was an invalid, but also that here in Davos he was naturally very much limited in his intercourse with men and books. There were many people who knew at first only one fact about Davos: that John Addington Symonds lived here. But he was an active as well as a passive advocate. As we have already seen, an article from his pen appeared in the "Fortnightly Review" soon after he had completed his first winter at Davos. There is no doubt that this article was a magnificent ad-

vertisement for Davos. The Davosers were naturally delighted. But another article from his pen, which appeared in the "Pall Mall Gazette" four years later, was of an altogether different character, and aroused, also quite naturally, very different feelings here. Mr. Symonds had in the meantime not only made Davos his home, but had also entered into the most intimate and even affectionate relations with its native population. When therefore a strongly worded communication bearing his signature and dealing with the sanitary condition of Davos in a far from flattering tone, appeared in a great English newspaper and attracted the attention of practically the whole civilised world, the Davosers almost felt that their friend had betrayed them. "I am in horribly hot water", he wrote, "about my 'P. G. M.' article. It has appeared in the "Freier Rhätier", 'Le Temps', and the 'Allgemeine Zeitung'. Everybody here is furious, and my dear Davosers look angrily at me."

Davos, as a remote Alpine hamlet, had, of course, originally, no drainage, and very little that we English would cover with the word sanitation. As the place grew there also grew up an ever more urgent need of improvement in this direction. Visitors began to demand it, to talk and write about it. The English took an active part in the agitation. One English hotel alone furnished a petition with seventy signatures. Dr. Gwillim wrote on the subject in "The Lancet", Mr. J. E. Murdoch in "The Times", and Mr. Waters in a pamphlet published in 1882. Mr. Symonds, however, was one of the first to take the matter up in public, and the strength of his position (and perhaps of his language) drew down upon him in particular the wrath of those who did not appreciate his standpoint and his purpose. Everybody acknowledges now that Davos never had a

truer friend than Mr. Symonds, and the Davoser delights to honour him. It should be noted, moreover, that Mr. Waters wrote (h5—6): "Perhaps if this letter had remained in Mr. Symonds' desk for a week the irritation might have been lessened by the modification of one or two expressions, but I think that he was too good a friend to Davos to have dealt with the facts less strongly, and in a second letter he pointed that what he had written was entirely done for the advantage of Davos, toward which he had most kindly feelings."

The agitation was successful. An excellent system of drainage was initiated in 1882 and completed (in its original form) in 1883, from designs and under the superintendence of Mr. John Icely, an English civil engineer resident at Basle. Since then it has been extended at various times to meet the growing demands of the resort. Further dangers which Mr. Symonds and other writers of that period thought they foresaw as results of the development of Davos, either did not manifest themselves at all, or when they did so were soon and successfully overcome. At the present day "the sanitary conditions in Davos are much in advance of anything to be found elsewhere in Switzerland" (i291).

Throughout his long residence at Davos Mr. Symonds continued to write enthusiastically about the valley and its neighbourhood, and in 1892 he published a collection of these writings (together with some contributions by his eldest daughter) under the title of "Our Life in the Swiss Highlands".

During his sixteen years of residence here, Mr. Symonds got to know Davos, and indeed the whole Canton, more familiarly than any other Englishman has ever known them. He explored every corner. His physical energy

was as astonishing as his mental. He undertook long mountain walks in all weathers, day or night; he would live on the plainest fare and sleep on hay, keeping up for hours and days together a pace that often tired out his sounder companions. He would travel all day and then sit up a whole hilarious night with his Swiss peasant friends in their own homes or inns, or talk the night out on higher intellectual levels in his own home. It would be exceedingly interesting to discuss his friendship with his beloved Graubündners; but space forbids. Mr. Symonds was of course head and centre of the English Colony, and a leader in its sports. He figures conspicuously throughout a large part of the story which remains to be told.

In the meantime another man whose name is now enshrined in our literature had come to Davos. This was Robert Louis Stevenson. He was here two winters. The first (1880—1) was spent at the Hotel Belvedere, and the second at Chalet am Stein, a dépendance of Hotel Buol.

A contributor to "The Courier" (November 23rd., 1889) who knew Stevenson while he was here, says that "in appearance he had at this time a great deal of the Shelley type, in his loose boyish figure, and restless radiant eyes, with a tincture in manner and conversation of French bohemianism; and if in his domestic menage there was an amusing reminiscence of a Colorado ranche, the life which was most to his taste was the more complete from the literary sympathies and ability of his wife". Mr. Lloyd Osbourne, his stepson, then a boy, came too, and it is related (also in "The Courier") that while they were staying at the "Belvedere" Stevenson was pressed by his stepson to while away the winter evenings by the recital of some exciting story. The "Treasure Island" was thus evolved, says

the "Courier" writer, and the boy, struck by the stirring narrative, exclaimed, "Print that, Mr. Stevenson!" The fact, however, seems to be that Stevenson had the plot worked out and the story partly written before he came here. He finished the manuscript at Davos, where he also wrote some of the best essays he produced at that period, including the two papers on "Talk and Talkers" (now included in the "Familiar Studies of Men and Books"), in which Mr. Symonds figures as "Opalstein". Interesting particulars of these two winters at Davos will be found in Stevenson's "Letters to His Friends", as well as in the "Life" by Mr. Graham Balfour. While here, Stevenson contributed several articles on Davos and the high Alps to the "Pall Mall Gazette".

Other English men and women of letters have also lived at Davos, and it may be convenient to mention them in this connection. Some of them came as friends of the Symonds family; others for the sake of their own or others' health, or for sport. It was as Mr. Symonds' friend that Professor Jowett came to Davos in 1882, 1886, and 1890, and through his letters we get some charming glimpses of life at "Am Hof".

Miss Beatrice Harraden, the author of "Ships that Pass in the Night", the most popular of the several attempts to put Davos into fiction, was here from October, 1890 until the following April. She stayed at Villa Germania, one of the villas connected with the Curhaus. The same winter Mrs. Oliphant was staying with one of her sons at the Hotel Victoria. Another of our literary visitors was Miss Annie Holdsworth (Mrs. Lee-Hamilton), one of whose novels, "The Valley of the Great Shadow", is about Davos. The Rev. Dr. Butler, Master of Trinity, Mr. Oscar Browning, Sir Conan Doyle, Miss Gordon-Cumming, Mr.

E. C. Benson (there are some Davos scenes in his "Relentless City), and Mr. Richard Bagot, have also been visitors to Davos.

After this long digression we must pick up the threads of our main story and follow them rapidly to their ends. First of all, however, a word about the popular doctor of the English Colony in those days.

One of the doctors to whom R. L. Stevenson dedicated his "Underwoods" was "Dr. Karl Ruedi of Davos, the good genius of the English in his frosty mountains". Dr. Ruedi, a native of Igis in the Rhine Valley, not far from Chur, settled down at Davos as District Doctor in 1875, giving up this position in 1879 for a practice among the visitors. His success was very considerable, and (having already been in America) he became the doctor in the English Colony. Indeed, his popularity and his practice seem to have surpassed his ambition, and in 1891 he again crossed the Atlantic, with the intention of settling down at Denver; but he soon returned to Switzerland, hoping to re-settle at Davos. Events, however, had moved so rapidly here that he saw no desirable opening, and accordingly made his home at Arosa, repeating for the younger resort the good work he had done for Davos. He died at Arosa in 1901.

We have already mentioned that in the very earliest days of the English Colony (in 1878) the preliminary steps were taken for the building of a church. A site was given by Herr J. C. Coester and Herr Caspar Buol (on behalf of the Buol family), and in three years nearly 1000 pounds was raised towards the building fund. Plans were obtained, but were found to be too expensive. Finally a church to cost 2,500 pounds was decided upon. The efforts to collect money were continued for two years longer. In October,

1881, part of the foundation was put in, and the wall of the chancel was built for a few feet. Then, on January 25th., 1882, the foundation stone was laid by the Hon. Evelyn Ashley, who had been a frequent visitor to Davos for the sake of his wife's health. Herr Issler was the local architect, and Herr Baratelli the contractor. It was felt, however, by some members of the Building Committee that the plans adopted were too ambitious, and, although the foundations were laid, the Committee passed a resolution in favour of diminishing the size and cost of the church, which was accordingly erected on these somewhat narrower lines. The cost, however, finally worked out to about 3000 *l.* The church was opened on Easter-Day, 1883, but was not dedicated until six months later. The gifts to the Church, then and since, have been too numerous to be mentioned here. We ought perhaps to record, however, that the pulpit was given by Mr. J. A. Symonds in memory of his daughter Janet, who died at Davos. The present organ was obtained in 1893, almost entirely through the efforts of Miss E. Fuller, who was for many years the organist. The Vestry was added in the same year. Electric light was installed in 1897. A Parsonage was built in 1903.

Very early in the history of the Colony it was felt desirable to have English nurses resident at Davos; but the frequent attempts made to arrive at some satisfactory arrangement, failed year after year. In 1882 two Mildmay deaconesses worked here for some months, but next winter did not re-appear. Then a nurse worked single-handed, the public making good the deficit. This, too, did not answer. In 1886 another attempt was made, five residents making themselves responsible for 100 pounds for one year, and for two years a lady lodged and boarded the nurses

in her house free of charge, the other expenses being defrayed by collections in Church and by donations. In the winter of 1889—90 a flat — opposite the English Church, and since known as as the British Nurses' Institute — was rented and furnished, a bazaar being held to help meet expenses. This Institute has ever since remained in existence, the expenses being defrayed, mainly, by donations; but it was not until 1895—6 that it was able to pay off its debts and meet expenses.

The year 1881 saw the foundation of the first English Benevolent Institution in the Swiss Alps and the earliest home for consumptives belonging to any of the foreign nationalities in Davos. In that year Mr. and Mrs. Lord settled in a house "In der Wiese" at Davos-Dorf, still known among the natives as "Haus Lord". When her husband died two years later, Mrs. Lord threw open the house for the reception of consumptive patients of limited means, at a nominal rate of payment, and devoted the rest of her life to this work. The Misses Crothers (Frau Langmesser and the late Mrs. Mitchell) generously helped her to bear the financial burden; but Mrs. Lord managed the house single-handed, labouring for her "children" (as she loved to call them) from early morning (rarely later than 5.30) till late at night. She did most of the nursing herself, and her ministrations as nurse were not limited to the inmates of the Home, but were frequently given in bad cases elsewhere. Her health finally broke down under the strain, in 1895, and she died at Birmingham in 1897. In 1895, however, the Home ("The Davos Invalids' Home") had been taken over by a Committee appointed at a public meeting held at Sir Hermann Weber's house in London, and the Council and Local Board of Management of the Queen Alexandra Sanatorium at Davos, who now have

charge of the Home, are really the direct lineal descendants (so to speak) of this Committee.

The first English library at Davos, of which we have been able to disinter any record, was that established at the Hotel Buol when Mr. Symonds lived there. In 1886, however, a public library was started with about 100 books in a room rented in Villa Florenza (afterwards Villa Sereinig). In 1887 a small chalet was built for the Library, on ground belonging to Dr. Ruedi, opposite the Hotel Victoria. Here the institution flourished steadily for ten years, and in 1897 was transferred to the present building, put up at a total cost of Fr. 12,300, on ground acquired from the Hotel Belvedere.

For the past eighteen years there has been an English weekly paper at Davos. It was founded in 1888 as "The Davos Courier", and was purchased the next year by the proprietor of the "St. Moritz Post". When it ceased to appear as a separate journal, it was succeeded at Davos by "The Courier for Ragatz, Prättigau, Davos and the Engadine", issued by a small local syndicate, which also published the corresponding German and French papers. In 1901 these three journals were taken over by the Public Interests Association (Verkehrsverein), and the English paper has since then been known simply as "The Courier".

We have already far exceeded the space originally allotted us, and, with material in hand for an article several times this length, are reluctantly compelled to stop. Sport we have had to leave aside almost entirely — and sport has figured so largely in English circles at Davos! We can only venture to add a mere handful of facts and figures indicative of the extent and activities of our Colony. In addition to the organisations already mentioned, and the various activities of the Church, the English Colony has,

or has had, the following associations and clubs: a Literary Society (which for many years successfully organised lectures, but has for several years been inactive), a Students' Society, a Chess Club, a Dramatic Club (these three also no longer in existence), an Amateur Photographic Society, a Clay Pigeon Shooting Club (founded 1892), succeeded by the Davos Gun Club (1898); the Buol (now Davos) Toboggan Club (1883), the Davos Tobogganing Company — Schatzalp Run (1906); Skating Club (which was founded in 1889 and has had its own rink since 1896*), a branch of the London Figure Skating Club (1904) the Davos (originally Belvedere) Curling Club (1892), with separate rink; a Bandy (Ice Hockey) Club, and an English Ski Club (winter 1902—3). — After a petition sent to H. B. M. Minister at Berne in 1890, a Pro-Consulate — afterwards Vice-Consulate, and now Consulate — was established at Davos, all three dignities having been borne by Dr. W. R. Huggard. — With regard to numbers, the English Colony scored its record in 1896, when there no fewer than 3257 English and 220 American visitors here during the year. Since then there has been a slight falling off; the number fluctuates from year to year, and during the past two years has again been on the increase.

But here an end. There is many a man, many an event, that we should like to memorise in these pages, and we can only hope that this or an abler pen will some day be afforded an opportunity of publishing an adequate history of our Colony.

*) The English Rink was originally 95 metres long by 40 wide, and cost Fr. 11,000. In 1898 its width was increased to 60 m., at an additional cost of Fr. 2,500.

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English Library

Communal Election at Davos
(open-air service)

St. Luke's (English) Church

Chapel of the Davos Evangelical Association

St. Paul's Church

Catholic Church of St. Mary

TOPOGRAPHICAL AND GEOLOGICAL

BY DR. K. MÜHLE.

Far from the rumbling hurry and the dusty turmoil of the great world, amid the solitary mountains of the Grisons, stretches the quiet valley of Davos. Here we are far above the fogs of the plains. No lowland vapour spoils the precious purity of the breezes or prevents our gaze from losing itself in the blue infinity of space. The giant mountains reach up all around the valley, towering upward like a bulwark of defence around its pleasant places; sheltering them, too, against the snowy winds from north and east, but not preventing the sun from scattering his gifts over the pleasant valley. The rays of the sun dive deep into the waters of the sombre lake, lovingly awaken the endless wealth of colours on the far-reaching, smiling meadows, illumine the encircling woods and heaths which form the broad border of the mountains, and gild the houses and huts, which reach from the banks of the hurrying torrent in the valley up to the remotest, highest pasture.

The Graubünden highlands form the extreme east of Switzerland. They boast the highest-lying alpine villages of Europe that are inhabited all the year round, and they are distinguished by an inexhaustible plentitude of all varieties of landscape charm.

The variegated carpet of the meadowland gleams beside lovely lakes, in whose waters mountain scenery of

sublime magnificence is mirrored; while in picturesque situations lie the villages with their proud palaces for visitors side by side with the lowly wooden dwellings of the Grisons peasant, strewn about at the foot of heights which conceal all the terrors of the high Alps. From the rocks bubble forth innumerable springs and curative mineral waters; between wood and heath, up to the edge of the eternal snows, the blazing sun unites its forces with those of the pure dry atmosphere to create a flora of entrancing beauty. Enormous regions of ice, like those of the Bernina and Silvretta Groups, or like those of the Grialetsch, Scaletta, and Porchabella Glaciers, look down, together with the eternal snows of high-towering peaks, upon valleys rejoicing in the excellence of their situation and the mildness of the climate. Here we find broad sheltered valleys at an elevation at which we are accustomed to see meagre alpine pastures and bleak mountain-tops over which the wind goes howling. It is such advantages as these that have enabled two of the most famous of health-resorts and alpine sport centres to develop in the highlands of the Rhaetian Alps, and which in particular have made Davos unrivalled as a winter health-resort all the world over.

Three excellent alpine roads open up access to the Davos Valley: the Landwasser road, so rich in variety, which was completed in 1873 and leads from the Albula basin, by way of Wiesen, up through the ravine of the "Züge"; the Flüela road, which, starting from Süs, in the Engadine, crosses the Flüela Pass (7,900 feet above sea-level), and terminates at Davos-Dorf; the Prättigau road, which, like the railway, climbs from Landquart, in the Rhine Valley, by way of Klosters and Laret, to the heights of Wolfgang, where it reaches the Valley of Davos at its north-east end.

The Davos Valley is a longitudinal valley and at the same time a border-valley of the Albula group. It runs from north-east to south-west. The upper part is trough-shaped, with a broad, level bottom and a slight fall of only $1^1/_2$ %; the lower part is narrow and of the nature of a ravine. The highest part of the valley, the Wolfgang station of the Rhaetian Railway (Davos Kulm), is 5438 feet above the level of the Mediterranean. Following the descent of the valley, the villages then come in the following order: Davos-Dorf, Davos-Platz, Frauenkirch, Spinabad, Glaris, — all on the right side of the valley, through the midst of which flows the Landwasser torrent. To the left, on sheltered sunny slopes of lateral valleys, spread out the villages of Clavadel and Monstein. Beyond these side-valleys, distinguished by a much steeper gradient and much narrower bottom, a few lonely mountain hamlets are situated.

The length of the valley from Wolfgang to the Züge, the boundary of the Davos and Belfort local government districts, is ten miles; at Davos-Platz, in its broadest part, it is about half a mile across. The lowest point, the bridge in the Züge, is just over 4200 feet above sea-level. To the left the Scaletta chain, and to the right the Strela range, run alongside the valley. Below Davos-Platz the two mountain ranges draw closer and closer together, until in the "Züge" they form a narrow ravine. This gorge of the "Züge" is one of the sights of the canton. Here the torrent has had to cut out for itself a narrow bed among the mountains; it shoots noisily along between walls of rock a thousand feet high, hurrying with tempestuous haste to the Albula. The road is here almost entirely hewn out of the rock. For a while it proceeds along the bottom of the ravine, then continues on the declivity of the right

side, protected by galleries and tunnels. The ravine gets its name from the tracks of the avalanches (Lawinen-Züge), which furrow the mountain-sides every winter, and the remains of which are often to be seen, in the depths of the gorge, even in the midst of summer.

While the mountain-wall on the left side of the Davos valley is broken by four beautiful lateral valleys — those of the Flüela, the Dischma, the Sertig, and Monstein — between which the mountains (rising to nearly 10,000 feet) slope down terrace-fashion towards the Landwasser, the mountain chain on the right side rises up very abruptly to its peaks almost 9000 feet high. The whole range from the Dörfliberg at Davos-Dorf to the "Züge" is broken by no broad stream-swept valley; only foaming torrents bubble and tumble in gleaming cascades from rock to rock. Over two passes, the Maienfeld Furka on the Amselfluh, and the Strela by the Schiahorn, the pedestrian may cross these mountains and proceed along the Schanfigg to the Rhine Valley at Chur.

Davos is divided from the Engadine by the Scaletta chain. Besides the Flüela road, there is communication between the two valleys by means of the passes over the Scaletta and Grialetsch (not altogether free from danger) and the Sertig Pass, at the end of the extremely beautiful Sertig Valley. Over the Monsteiner Joch (ridge), at the end of the Monstein valley, there is also a by no means easy path to the Albula and thence into the Engadine.

The high ranges already mentioned protect Davos towards east and west. The Valley is, however, not immediately closed in by the mountains at its northern end; but there, to the north and north-west, rises up, on the other side of the Prättigau, the enormous, beautifully-outlined rampart of the Rhätikon, which forms a protec-

tive wall drawn across in front of the valley. Beneath the Rhätikon, but on this side of the Prättigau, is the mountain-saddle of Wolfgang. At its foot the Davos Valley begins, and here lies the beautiful Davos Lake, the jewel of the district. It is about a mile long and nearly half-a-mile wide. It greatest depth is about 150 feet. To the west and north it is bordered by gently-sloping meadowland, which then gives way to beautiful woods of mountain-fir, reaching up to the heights of Wolfgang. Then over the Wolfgang ridge peep the jagged pinnacles of the Casanna and the gloomy massive of the Todalp. From the latter the Totalp-Bach rushes down over its rubble bed to the lake. On the east and west the lake is bounded by the first mountains of the Scaletta chain: the "Hörnli", which gradually rises up, from near the Drusatscha-Alp, with large fields of alpine-roses, to a height of 8070 feet; and the steep Seehorn (7350 feet). From both heights numerous runnels of water hurry bubbling and bounding down to the valley, there to fill the basin of the lake with clear, dark green water. The walks round about the lake are among the most beautiful in the Davos Valley, and the fascinated wanderer is never tired of extolling the views which are presented to his gaze from the wooded slopes below the Drusatscha-Alp. To the right he sees away over the broad bay-like stretch of water below Wolfgang to the Casanna, the slender Grünhorn, and the undulating Parsenn-Alp; in front of him lies the glittering expanse of water, beyond which gleam the mountain-encircled houses of Davos; and on the horizon the picture is finished off by the peaks of the Albula group. And what a wonderful enchantment spreads over the landscape when the moon has climbed up over the Seehorn and is reflected in the quiet waters! In winter, certainly, the lake is cover-

ed with a layer of ice three feet thick, so that the most heavily laden sledge may ride over it. — The water which flows out of the lake at its southern end unites with the Flüela stream to form the Landwasser. This latter receives on its course large quantities of water from the Dischma, Sertig and Monstein Valleys, as well as from numerous wild torrents on the right, of which latter we will mention only those which come down by Davos-Platz, namely, the Schia-Tobel and the Alberti torrent. The fall of the Landwasser becomes gradually steeper, and it finally unites near Filisur with the Albula, the waters of which flow into the Rhine at Reichenau. In this direction, and beyond the ravine of the "Züge", an impressive background to the landscape is formed by the sharp, characteristic dolomite pyramids of the Tinzenhorn (10,301 feet) and of Piz Michel (10,400 feet), with, between them, the peaks of Piz Ozur (8910 feet), and, somewhat aside, the highest mountain visible from Davos, Piz d'Aela (10,900 feet), with its gleaming glacier dome.

The history of the geological development of the high-lying Landwasser Valley into its present-day form shows that it is older than the Valley of the Landquart (the Prättigau). The Valley of Davos is a valley-torso. We must suppose that at an early epoch of the earth's history the Landwasser valley reached out beyond Wolfgang and Klosters to the Schlappiner-Joch. It is there that the original source of the Landwasser must have been. The stream then flowed high above what is at present the Talsohle of Davos, down to the Albula, which probably at that time, rushing along far above the village of Tiefenkastel, formed with the Julia one northward-flowing stream.

The Prättigau was therefore shorter than now, and

terminated in a mountain barrier which united the Madrisa with the Casanna. The Landwasser then received the spring-waters from the Silvretta and Vereina Valleys, as well as those of the Casanna. But during the time the Davos valley was being worked deeper and deeper, the Prättigau had developed into a side-valley of the Rhine. Its river, the Landquart, sawed its way through the soft slate-stone, lengthening out in a backward direction until it cut through the barrier at Serneus and fell sideways into the Schlappinerbach. The latter must now, together with the waters from the Silvretta, flow towards the Rhine along the bed of the Landquart. The watershed was put back to Wolfgang. At this time the valley-bottom at Davos lay at about the same elevation as the wooded ridge at Davos-Kulm. The Landquart, with its increased power, excavated in the course of time the enormous channel which now forms the Klosters valley. The considerably shortened and now weaker Landwasser was far from being able to develop the same erosive power, and so it has come about that Davos has remained a high-lying valley with a comparatively broad bottom. At one time, however, the Talsohle must have been about 150 feet lower (about the depth of the lake); but the torrents coming down the side-valley to the left rolled down such enormous masses of rubble that the Landwasser was unable to carry them on any further. Barriers arose, behind which the Davos Lake, and probably also two smaller lakes between Davos-Dorf and Frauenkirch, were formed. The existence of a peat-bog between these two places points to this. By washing out for itself a deeper channel through the "Züge", the Landwasser later on again procured itself a steeper fall; a part of the rubble deposit was swept away, and the Lakes, with the exception of the one still existing,

flowed out. Remains of the rubble deposit are to be seen to this day at Frauenkirch, heaped up nearly 100 feet above the level of the stream. Owing to the slight fall of the Landwasser in its upper part, that portion of the valley near Davos-Platz was in the second half of last century in danger of becoming a marsh, and this danger was only set aside about a quarter of a century ago by the expensive regulation of the course of the stream.

The mountain-ranges which, like ramparts, enclose the Davos Valley, are built up to a large extent of primitive rock, in addition to various sedimentary rocks (especially gneiss and mica-slate, verrucano, limestones of the triassic and lias formation). Conspicuous among the former are the early eruptive feldspar rocks — granite, porphyry, syenite — and the plagioclas rocks, diorite (greenstone) and gabbro.

Southward sloping mica-slate, alternating with gneiss and hornblende-slate, prevails exclusively on the whole left side of the valley: the Seehorn alone contains some limestone, in very much split-up masses, at the entrance to the Flüela Valley. The Schwarzhorn, at the end of this valley, is composed in its upper strata entirely of hornblende-slate, and the Weisshorn, opposite, of granite gneiss.

In the Monstein and Ducan chain, in the Sertig valley, the gneiss ceases to be in evidence: it forms merely the foundation on which the triassic limestones and the rocks of the verrucano group repose. This group comprises various coloured sandstones, quartzites and the grey wackes, from semi-crystalline to clastic forms. In our district they really belong entirely to the diastite or permian system.

The triassic limestone strata consist principally of gypsum, marl and red-land lime-stone. Upon it rests for the most part laminar limestone (roofing limestone,

dolomite), also belonging to the triassic system. The defiant precipices, the rugged pinnacles and ridges, the white mounds of boulder-stones at the foot of the peaks, make this kind of rock recognisable from afar. It composes the bold forms of the Bergün massive (Piz d'Aela, Tinzenhorn, and Piz Michel), the heights at the back of the Monstein valley and the bold rock-structure of the Ducan group. This description of rock ranges in colour from bright to dark grey, with veins of calcareous spar; it is granulous inside, and dusted with a whitish hue on the outside. The rock crumbles into angular pieces, and the mountains which are built up of it have a ruined appearance. But it is precisely this quality of crumbling easy that has formed those bold pyramids and magnificent domes, those walls and battlements as of lofty towers, which contribute so much to the beauty and the animated character of the landscape. At Schmelzboden and in the "Züge" the valley terminates in limestone formations. Here, nested in dense blackish-grey limestone, is to be found the argentiferous galenite, which was smelted until nearly the middle of the last century.

The basis of the chain on the right side of the valley consists of gneiss and verrucano. An enormous limestone covering forms in the lower part the surface of the mountain mass. Thick woods cover the lower portions, the upper heights being grass-grown. The easterly lower portion of the limestone covering comes to an end on the Kummerberg, near Glaris; in vertical walls the limestone still rises up, with a southerly fall, on the left side of the Kummer-Tobel; but further to the north the slopes no longer have this covering, and as far as Laret other rocks appear in its place. Among these the dolomite chiefly prevails, covered, however, on the mountains above Frauenkirch, by an enormous layer of mica-limestone. In the bare,

dreadfully split-up Schiahorn group, just above Davos-Platz and Davos-Dorf, the nature of the dolomite rocks comes into full view. The grey rocks are furrowed with innumerable cracks and flaws. As a consequence of weathering, the propensity to split increases to such an extent, that when struck the rock breaks up into quite little pieces. This is the cause of the continual renewal of the great mounds of debris at the foot of these mountains, and the peaks, thus subject to continual fall and decay, assume the most wonderful outlines.

Northward from the Schiahorn as far as the Totalp begins an extremely remarkable succession of crystalline rocks, gneiss and granite alternating with diorite and mica-slate, between which are layers of grey limestone, with occasional detached masses of pale blue saussurite and brown talc.

In the Totalp the serpentine rock appears in enormous masses, and it is also to be found in black heaps on the mountain-ridge more to the north, between the Casanna-Alp and the Parsenn-Alp, as well as towards Laret. In the same way, there are frequent mounds of slated and jasperated serpentine rubble among the mica-slate and quartz-rock of the Dörfliberg, as far as Davos-Dorf.

This rock is a black-green, common, compact serpentine, often shot with veins of limestone. Asbestos, tremolite, mica, and bronzite are found in it. The neighbourhood of the Totalp gives an impression of waste and gloomy loneliness. On this unfruitful soil grow only here and there a little moss, some kinds of saxifrage and cerastium; weather-beaten fragments and clods lie or are piled up all around; the rent forms of the mountain-ridges, the walls of black rock, over which the water trickles without being able to awaken life, involuntarily remind one

of a field of lava. The acme of destruction and desolation is exhibited in the Totalp Schwarzhorn (8760 feet), whose sharp, angular black form stands out conspicuously against the blue sky. A little further on there rises out of the black rocks a great, shining-white mass, which at a distance might be taken for a glacier. This is the dolomite Weissfluh, which, now isolated, must be regarded as having once been connected with the Schiahorn. The upper part of the adjoining Casanna also consists of dolomite. The basis of the Casanna and the adjoining Cotschna, in which slate predominates, has an intricate build, masses of gypsum, serpentine and gneiss encroaching one upon another. Here the Davos mountains border on the Prättigau and the Schanfigg.

Such are the geographical and geological conditions which have stamped Davos as a splendidly protected mountain-valley, over which the genial sun reigns supreme. And there is one blessing here which is in particular salutary, especially to invalids and those in need of recuperation: the blessing of peace and quietness,which is here liberally extended over the whole domain of nature. We feel its fascination when mountain and valley rest beneath a thick coverlid of gleaming snow, and a sea of light shines around us; it takes our souls captive when at last the spring has come, and has covered the earth with its beautiful blossoms, from the friendly gentian in the valley to the edelweiss on the highest ridge. But this mood rests on the valley most powerfully and impressively when, as summer departs, the mountain summits glow rust-brown like the fabulous loadstone-rock; when the larch stems gleam like torches among the dark pines, and the lake rests so tired and steely between its shores.

THE DAVOS PEASANTRY*

BY DR. W. SCHIBLER.

he homes of the Davos peasantry are dotted about in true Teutonic fashion over the valley and on the slopes. Each is in the midst of its own patrimony, — the fertile meadows which are the pride and principal wealth of the country. There is only one village, in the ordinary acceptation of the word, in the whole valley, and that is Monstein. Even there it was only the nature of the situation on the sunny slopes of the little valley that compelled the inhabitants to arrange their houses in the form of a village lane. Everywhere else in the Valley the bright whitewashed houses, open on all sides to the full flood of light and sun, gleam singly from all parts. . . .

It is a well-developed, hardy race that dwells in these simple houses. The men are often powerful fellows, with wavy hair and flowing Grisons beard; the women slighter, with dark complexions. Only here and there does a reddish hue betray Teutonic descent. . . .

Their food is simple and nourishing, and, as there are no paupers at Davos who at night do not know where to lay their heads, and in the morning where to get bread enough to keep them through the day, the diet is everywhere about the same. In accordance with the nature of the country, which makes cattle-farming almost the sole industry, the animal kingdom affords the staple forms of

* From an article in the Year-Book of the Swiss Alpine Club, Vol. XXXV., 1899.

food. Milk, butter, a rather poor kind of cheese (Magerkäse), meat, and eggs create and promote strength. In every home a few pigs, sheep, goats, and a cow, are killed once in the year. The flesh is preserved, either in the form of sausages or in joints, by hanging it up in the air; for in the pure, dry mountain air meat does not go bad. The best joints of beef, hung up outside every house (the so-called "Binden"), afford a dish of incomparable nourishing quality and flavour. Bread, rice, polenta, and potatoes are added from the vegetable kingdom, but this latter does not figure nearly so largely here as a source of nourishment as it does in the bill of fare of the lowland peasantry. If the Davoser occasionally allows himself a glass of wine, it is always the Veltliner wine usual in these parts, and whose fame one first learns to appreciate on the mountains of Graubünden; for it is only at alpine heights that all its qualities seem to mature. Even when the Davos peasant grows his own barley, he no longer bakes at home all the year round. In fact, the amount of corn he harvests would not suffice for this. He uses the straw, often feeds the fowls with the corn, but even now in the lower parts of the valley it is ground in primitive mills, and the meal, when mixed with bought flours, is said to make particularly good bread. For the New Year the careful housewife bakes a sort of superior bread in which liberal quantities of raisins or shredded pears are mixed, and this, eaten with "Röteli", a home-made beverage, figures in the celebration of the festival. Except at this time, practically all families buy their bread. "Papa Lendi", the Dorf baker, drives out every week on his fixed days, his cart packed high with loaves. Let the weather threaten how it will, he never fails to travel down the main and up the side valleys. Now and then he stops and blows his

horn, and then the guardians of the hearth hurry down from all the mountain slopes to replenish their exhausted stores. And so it may happen that, in the height of winter, baker and doctor meet on the lonely roadway, which has been made impassable by an avalanche, and unharness the horses from their sleighs in order to help one another over the obstruction.

The health of the people is excellent. Everything is in their favour: the nourishing food, the woollen clothing, a climate which even in winter invites them by its calm atmosphere and bright sunshine to live an outdoor life. Similarly favourable is the custom of living in detached farm-houses, and very seldom in houses grouped together into a village, in which latter the accumulations of refuse of all kinds very often favour the breeding of diseases. Light and air have everywhere free entrance to house and yard, so that even the inadequate ventilation of the rooms does not do much harm. Thus the schools are not frequented by pale and everlastingly poorly children, with tuberculosis, scrofula, and rickets as their inheritance. These complaints are, in fact, rare visitors. No; the young people look out upon the world fresh and healthy, and it is all their life through much to the benefit of body and mind that at the age in which the foundation for future strength and power of endurance is laid, they may play about all the summer long in the open air, in the woods and on the mountains, and so develop heart and lungs. Sound in body and mind, the children go willingly enough to school, and it becomes a pleasure to them to learn. It is, indeed, often difficult to keep them at home when they are ill: they always want to go to school.

When the winter is over, and the girls and boys must store away in a corner the toboggan which, fresh from

a rush down the mountain-side, they have so often taken with them to school, — when, in short, spring has come, then all hands are put to field-work, spreading the manure on the slowly-greening valley-meadows. Finally, at the beginning of June, but not before the regulation date, they go up to the high-lying pastures ("alps"). Each peasant goes off alone, without much noise and bustle, and without the singing customary in some parts, although not exactly without a sound, for each cow has its bell. Every head of a family possesses his own "alp" or shares one with a few of his neighbours. Except at Monstein, there are scarcely any common lands (pastures or woods) in the Davos Valley. Almost all the land has become private property. At the very end of the valleys, where the larch and the cembra-pine will hardly take root, the "alp"-huts lie close to one another in hamlets, standing in single file along the valley-stream. It is so in the Dischma, almost as far as the glacier; also in the Sertig, and in the Monstein side-valleys. Or, the huts are grouped around the common "Sennerei" — the dairy-sheds common to them all — on the mountain-side, near the tree-limit, between about 6000 and 6500 feet above sea-level, always surrounded by woods and pleasant meadows. Rarely, as on the Loch-Alp, single huts are to be seen rather higher up the "alp"; but the cattle always have a long run right up into the highest pasturage, as far as the green-growing ridges . . . . Here and there, further up towards the peaks, a lonely, extremely primitive stone hut is to be found, into which those in charge of the various herds may creep, but which is not to be compared with the often comfortably furnished summer cottage, in which the peasant, with his children and household, his pigs, fowls, and cats, remain until September. In the deep, rich meadow grass

sound the bells of the cows which in August climb up to the sunny, flower-strewn ridges, here and there to a height of 8500 feet. Amid the solitariness of the poor, higher-lying "alps", the bells of the dry-cows are heard tinkling even in the very recesses of the wild Ducan. There, too, for some weeks, even a few horses gambol, though how they manage to find their way through the waste wilderness of stones passes comprehension. Herds of lively goats clamber on the ridges and peaks, being driven out each morning by the youthful goatherd and brought back by him at sunset to the little summer-village. It makes a charming alpine picture to see these animals as they butt and tease one another, and as each one finds its way to its own stall. The sheep graze in the same parts as the goats, often left to themselves for weeks together and straying far away into strange pastures. The milk which the peasant does not want for himself, he sells at a fixed price to the dairyman at the general dairy, who makes it into cheese and butter. In July haymaking begins, and continues without a break, except, at least, for bad weather, until well on in September. The rich meadows in the valley are first cut, and the fragrant hay is stored in the barns built over the cattle-stalls and in the numerous dark-brown block-houses which are scattered about everywhere in the meadows, so that to a stranger the countryside seems more populous than it really is.

When the glory of the more fertile meadows has fallen before the scythe, then comes the turn of the less productive meadows. But rainy weather very often hinders the merry progress of the work, and day after day the wet grass must hang sadly on the props which it is here the custom to use for drying it upon. Finally, at the end of August, the cheerful band of mowers and haymaking wo-

Davos Chalets

Peasant's House at Davos

Types of Davos Peasantry

men find their way to the broad grassy slopes above the woods, reaching up to a height of 6000 and sometimes even 7000 feet. Crossed by numerous runnels and streams, which sink into deep defiles only when they get into the woods beneath, and often watered by these peaceful meadow streams, but never manured, the herbs and grasses in these pastures grow particularly thick and fragrant, but so short that it is difficult to conceive how the scythe can cut them. Although the crop may not be large, the hay is at any rate exceptionally good and fragrant and highly nourishing. It is stored away in all those little brown block-houses, which, from the valley, look like black dots scattered about over the green of the alpine pastures.

The Hay-Sunday festival in the middle of August, marks the height of summer life on the alpine pastures. Then there are merry doings at Sertig-Dörfli, when once the parson's sermon in the old mountain church is ended — the little church to which in summer he has so often climbed. Wine, song, and jollity flow on till morning.

Autumn generally announces itself at the beginning of September with a fall of snow, which often lies heavily on the potato patches and the barley-fields, which latter, now at last yellow, nod from all the heights and publish abroad the fact that Davos is within the corn-growing zone. By the middle of September the crop is ripe for harvest, and soon the homely sound of threshing is heard here and there from the barn-floors. The careful housewife also has a harvest of her own. She collects and cooks in great boilers over open-air fire-places the tall, leafy stalks of the alpine sorrel (rumex alpinus), which grows profusely in the richly nitrogenous substratum around the stalls. This concoction she stores up in plank-lined holes in the earth, ready for use as a winter food for the pigs when

fodder is not plentiful. In the valley-meadows, also, there is now new work to do. In many places a fragrant aftermath is being gathered in, though only too often the sweet-smelling heaps are crowned with snow. Once more in October, all hands are found in the fields, this time to manure the meadows again, so as to ensure the next year's crop. Meantime, at the end of September, the herds have come back, one by one, as they went away, without the festivities which takes place in some other parts. Now all is still and lonely, almost sad, among the once so lively alp-huts. The windows are shuttered; no smoke hangs over the dear little summer-village; no living creature is to be seen — except perhaps here and there on the sunny pastures a mouse-hunting cat, which, forgotten when the family returned home, now remains for a few days on her own account to enjoy the peace and quiet, but always eventually finding her way home again alone. Some weeks later, however, a few herdsmen go back again with their live stock to the recesses of the valleys, and use up the hay stored there, often staying almost till the New Year. Here they live absolutely alone with their cattle, and are often snowed in until their return. The Grisons peasant is a very self-contained sort of man, and as a rule does not indulge in much loud expression of his joys and pleasures. Nobody — not even his companion — very easily gets to know what he thinks. This fact was well expressed by the Landammann (Mayor) who finding himself defeated when he had been confident of re-election, exclaimed: "People, people, you are a close lot!"

But the winter has not come yet; it has only threatened, and fine and still finer days follow in unbroken succession, sometimes for weeks together. This is the time when the cheerful cow-bells are heard in the valley-mead-

ows, the poetical season of the cowboys' life and of the chase. He who has once, gun in hand, ranged through the autumnal mountain woods, where warm rays from the cloudless sky play about the grey and ruddy trunks of the magnificient natural park — all around so inexpressibly solemn and still, everywhere the full daylight flooding into the forest darkness; only now and again a sound, the tapping of a woodpecker, the rustling and angry snarling of a squirrel, the wanton play of the mice, the soft fall of a fir-cone tossed away by a cross-bill, then a great fluster caused by the flying up of a scared heath or mountain cock — he who has experienced all this, will always remain under the spell, and will again and again yield to the fascination. The peasant himself does homage to this noble passion and hunts the fleet chamois along the mountain ridges, or the shy fallow-deer, which have become numerous in the woods, or even the stags, which during the past two decades have again taken up their haunts in the Davos Valley, and which in spring find their way into the seed-snow fields; and even if he does but catch a marmot, he is ready enough to relate his adventures in the evening, over his glass of wine, in club-hut or hospice. And still more lonely does it become in the woods and on the far-reaching "alps" and mountain ridges, tinted grey upon grey, when first the hunter snares the alpine hare and the white grouse, which with each snowfall come farther and farther down from the ridges to the woods, and become whiter and whiter the nearer they approach the haunts of the brown hare. At last they come face to face with these latter and with the rock partridge and the proud heath-cock, until one day in the middle of November an infinite blurred multitude of snowflakes comes floating down from the skies, and covers mountain, wood, and

valley, and every living thing, beneath its widespread mantle.

The mountains are snowed-in, and for half a year the white mantle is not lifted from the valley. It is already a long time since the farmer moved his cattle into their winter quarters, in the warm cowsheds. Part of his time is occupied in fetching down the hay from the widely scattered barns, on low sledges, which he either guides by hand or to which he not infrequently harnesses a bullock, travelling along ways on which the snow often lies deep and untrodden. The great bundles of hay, from the pastures above the tree limit, are fastened tightly to the sledge, with a layer of straw beneath to make the gliding easier; and to guide this on its mad carer down the steep clearing through the winter woods, requires no little strength and skill. The tending of his cattle, the feeding and the milking, are the poles of the Alpine peasant's life in winter; while a good deal of time is often dedicated to sweet repose beside the ever-warm stove, fed from the great heap of wood under the windows.

Here and there one sometimes meets a wandering herd of cows, and very strange do the bells sound (reminiscent of the summer journey to the higher pastures) in the silent, white, winter landscape. This is a dairy-herd on its way along the narrow, uneven paths, from a place where the fodder has been exhausted, to another pasture, there to find shelter until the spring; and often the herdsmen takes his family along with him.

A fresh form of activity has awakened also in the woods. The proud tree-trunks fall cracking before the axe and hatchet, and the logs dart like arrows down snow-runs to the traffic-beaten roads in the valley. The woods, in days gone by not made much account of, have

now become a valuable property, and it is to be hoped that they will be more and more economically dealt with.

Winter, and the remoteness of the farm-house, unite the whole family around the hearth. It brings hearts, too, into closer unison, promotes the love of children for parents and of parents for children. Never have I seen a heartier relationship among human beings than often exists among these simple peasant folk on the high mountains. And what prudent and finely constituted women are to be found, who bring up half a dozen or even a dozen children for their country, in a lost and lonely world made up of mountain-slopes rising up on either side, covered with gloomy woods, beside a rushing torrent in an odd corner of a valley. Overhead stretches a patch of blue sky, out of which, when all goes well, the sun shines for a few hours in the middle of the day — and that is their world! In another place a house clings to the mountain-side. Its only protection is a small wood above it; and under this roof parents and children sleep peacefully year in, year out, even when at night there thunder down on either hand the avalanches which have already buried so many. Here the peasant holds faithfully on, maintains the cultivation of the land, and ever anew trains up for the Republic her ancient support.

How circumscribed is the existence of these people! Their life and thoughts are simple — fortifying as the food which nourishes them, healthy as the air they breathe. Their customs are patriarchal. Labour and repose, joy and sorrow follow one another for ever along the same ancient ways.

What fine, aged mothers, sturdy old grey-heads, dwell under the old roofs! — not walking mummies, whose marrow and feelings were long since dried up; but, sound

as the larch and cembra-pine on the borders of the woods, weather-beaten and tousled, it is true, like these, they live on to the extreme limit of age, until the final storm stills for ever the old, worked-out heart.

How low, too, is the infant mortality, in spite of the fact that, owing to lack of mother's-milk, the child is brought up almost from the first day on cow's milk, or may even be given its first "Schmalzmüesli"*. No possible substitutes, however, can take the place of healthy birth, careful nursing, and good cow's milk.

There are still some original characters to be found here among the old people. Just one example, and a little story. Hansli, of the Längmatte, was no longer young when he went a-courting, and no Adonis either when he led home his Dorothy, who was only ten years older than himself! He wanted very much to find out how deep the affection of his spouse really was, and so he decided to put her love to the test. Hansli got up on this particular day in an extremely bad temper and quarrelled with Dorothy from early morning. As she only let him run on as he pleased, Hansli told her at last that he knew very well she would trouble little enough even if he were to do himself an injury. To which Dorothy curtly replied: Try it on! Thereupon Hansli cried out in a rage that she would rue having used such words; and then he stormed out of the room and went upstairs to the bedroom. Hurriedly he snatched the gun from the wall, opened the window, and a tremendous report was heard; his body fell with a heavy bump on the floor. The smoke floated slowly out of the window. For an hour, two hours, all was still. At last Hansli came creeping dejectedly down the stairs,

*) This is a common local food for infants. It is a kind of pap, made of flour boiled with butter.

and called out angrily to his Dorothy, who awaited him composedly in the living-room: "You see! Didn't I tell you I might die without your troubling yourself about it at all?" Dorothy said never a word, but a quiet smile spread over her face. She knew her Hansli only too well.

Winter is also the season of love. Leisure and opportunity bring hearts nearer together. Then the lad comes of an evening for a talk at the window, or in the living-room, and many a stove-side seat could tell love-tales. After Christmas the young men take their sweethearts for a brisk sleigh-drive through the still, white country, and in spite of the stinging cold, many a modest flame that had spread but slowly before, now flares up into a glowing blaze. But the older folk are not to be outdone, and in proof that the matrimonial fire has not been extinguished by the daily struggle for existence, the wedded couples also have their special sleigh rides down the valley or up to the icy ridge of the Flüela. Cold can warm hearts no less than summer heat.

Once a week, on Tuesday, the peasants stream in from their valleys to market at Platz. On simple sledges, with a seat improvised out of a corded box, they bring their produce for sale: wood, calves, potatoes, meat, cheese, game. Many a one who has no steed in stable makes the long journey on foot, and it is a strange sight to see sturdy men with little baskets of butter, eggs and small cheeses, on their arms. After midday they collect in groups in the open space by the old Rathaus, and then begins the merry ride home, the sleigh all packed full of country folk.

What a contrast! Here at Platz, a bit of a city in its way, with enormous hotels, elegant villas, large shops, all flooded at eventide in a brilliant sea of illumination, the streets and pavements alive with a gay crowd, represent-

ing every language, every range of education, every faith, gathered here from off the face of the whole earth, the strangest town in all Europe, at an elevation of more than 5000 feet, — and there, close by, the old folk, simple and content, the world forgetting, by the world forgot, living in their lonely farm-houses, away there in the folds of the Sertig, in the Spina, on the Hitzenboden, where never a stranger is known to stray. There in the radiant sunshine they stand, as if in a fairy-tale, those quiet houses amid the metre-high snow, with the black woods, the white snow-field, and the blue sky above them. Except that at noon on fine days the melting snow drips gently from every roof, all around is so wonderfully still, so strangely peaceful. Here if anywhere the wounded heart must heal, here the unstrung nerves find rest again. Slowly the days wax, and the snow wanes; slowly the meadows grow green, while the stream of visitors, following the direction of the waters melted from the mountain snows, hurry downward to the luxuriant lowland spring. Up here, however, nature is still in a stern mood when on the second Sunday in May, the inhabitants assemble from all sides in front of the venerable Rathaus, which has seen its centuries and lived in history. There in open meeting the fate of the district is decided; "Landammann" and council and magistrates are elected. Bacchanalian joys fill out the night, and happiness enters every breast; for soon the time will come to live once again on the mountain pastures.

When a hundred years hence the wanderer, having climbed the threshold at Wolfgang, gazes with astonishment for the first time at the dreamy lake, the wide valley, into which, serious and significant, the Tinzenhorn's proud pyramid looks down, — what will he find? A finer and a larger town? Who can say? But one thing

at any rate will be found to have remained — the old folk who first made the soil their home, the free peasantry of the high mountains.

I finish with the words of Gottfried Keller:

Und dennoch ist's das echte,
Das bleibende Volk, das rechte,
Das auf der Scholl' erblaßt, auf der es ward geboren;
Das Schifflein geht verloren, dess' Anker diesen Grund nicht faßt.*

*) And yet these are the genuine, the true and lasting folk, who grow grey on the soil on which they were born: the ship is lost whose anchor does not hold to this rock.

THE DAVOS CLIMATE

BY DR. K. MÜHLE

When the middle of March is passed, a succession of wonderfully fine days generally rejoices the countries situated at this latitude. In the plains the spring celebrates his return. The traveller who at this season comes from the north towards Davos, finds himself, when he reaches the Lake of Constance, breathing an air which by its mildness reminds him of the sunny fields of Italy. The shores are lit up all around with the tender tints of blossoming fruit-trees; young and old are adorned with the fresh children of the spring; the sun sheds its glory over green-growing meadows, and mirrors itself in the lightly moved waters of the basin through which flows the Rhine. But from far away in the south-east the traveller gets a winterly greeting from the mighty bulwarks of the Grisons mountains. Snow crowns their jagged summits and reaches far down their slopes. And then when the Rhaetian Railway has brought him up to his goal in the midst of these same mountains, the whole wide valley broadens out before the traveller's eyes beyond the summit of the pass at Wolfgang, clad in the white robes of winter. The snow still lies deep over the earth, from the highest ridge down to the meadows in the valley, although the spring lies shimmering over the flowery fields far beneath.

Nowhere does there seem to be a sign that the spring is approaching these mountains. Only those who know the

district well are aware that on the slopes, in the shelter of the fir-trees, the snow has retreated here and there before the hot rays of the sun, and that there, between ramparts of snow, the first tiny bells of the *Erica carnea* gently, very gently, ring-in the spring.

In March, indeed, the sun shines warmly upon the broad valley. Its warmth, in fact, is felt more than at any other time of the year. An infinite plenitude of light flows around us, and it is a joy, wandering along the paths down in the valley itself, or in the early morning working one's way upward over the hard snow, to breathe-in the pure air. But weeks go by yet before the last avalanche has rolled rumbling to the valley, before the lake with thundrous cracks rends its covering of ice, and the green of the meadows once more refreshes our eyes. Thus high among the mountains the time for blossoming, ripening and seed-scattering is short indeed. The plants are therefore in a hurry, and there follows immediately an exultant alpine spring. After the snow has at length taken its departure, the spring-thirsty shoots and sprouts at once find themselves in a mild atmosphere, and every free spot is covered as if by magic with a carpet of flowers of such beauty of colouring as only the intensity of light and the serenity of the high mountains can bring to birth. Even in May, however, snow frequently falls at Davos; but it does not hold out long when the sun breaks through, and after a few hours the buried blooms push their heads joyfully through the white coverlid. The real vernal month at this altitude is June. Then the meadows, the mountain-slopes, and the woodlands are strewn over with blue gentians, with anemones, ranunculi, primulas and soldanella; the carnations nod their feathery heads, the larches clothe themselves in light green, and everywhere one hears the

trilling of the songsters newly returned to the woods. The dairy-farmer goes up to the higher-lying pastures. The buds of the alpine roses swell in the warm sunshine, to gleam out in July with the flaming purple of their blooms from the darkness of the woods. The height of summer is reached. The days are warm; but a gentle valley-wind prevents the heat from becoming oppressive. The nights are cool and refreshing on account of the powerful nocturnal radiation into space. Now and again the tops of the mountains are covered with freshly fallen snow; and even in the valley there is no month when one is sure that the ground will not some morning be covered with white. It is, indeed, the rule that in summer itself there is snow on the average once in every month. But in a few hours it has melted, and then, the soil being very permeable, the roads and paths are very soon dry again.

When on the heights the stars of the edelweiss are fully unfolded, and in August the slopes are covered with the red carpet of the heather, the breath of the coming autumn blows admonishingly through the valley. Now and again there is a frost at night. Among the yellowing grass in the meadows the meadow-saffron shows its tender blooms. The cattle are driven down from the mountains to the valley; the dairy-farmer must take leave of his pastures; the summer is at an end. Snow now falls frequently on the heights. Winter is drawing near; but before his arrival the whole mountain-world is transfigured once more in gleaming splendour. Beautiful sunny days illumine the landscape, while the life of nature gradually dies out. The valley, which in itself cannot be reckoned among the most beautiful in the Alps, is at this time in a charming, fascinating mood. — Vegetation, as it dies away, spreads golden lights and colours over the meadows

and the woods; from the darkness of the fir-woods the stems of the larches gleam towards the sky like amber-yellow torches, and their fallen needles weave a soft carpet across the paths.

From the middle of October onward the thermometer generally sinks at night to freezing-point, or even lower. Now and again a northerly wind begins to blow, and one fine day the first flakes flutter down from the sky. It is true that the sun folds them impetuously in his hot embrace, and they are soon gone. But the time draws ever nearer when the big snowfall is to be expected which the sun is no longer able to remove.

It may be about the middle of November. The early morning is very cold; at 9 o'clock about —15 ^{0} C. The sky is at first clear, but it quickly becomes covered to the south and west with cirrus and stratus clouds. Soon the whole arch of the sky is like a great grey dome. The temperature rises; a few snowflakes float slowly down to earth. The valleys are filled with a peculiar blue, out of which the tops of the mountains rise up fantastically into the grey air. The streaks of pine-trees on the mountain-sides are of a deep indigo. An indescribable quiet rests over the world: the wind has entirely ceased to blow. After sunset the masses of cloud sink deep down over the valley; the snow falls thick and fast. Next morning it lies from four to five feet in depth. In the meantime, however, the air has become dry and mild. It is now very pleasant to walk through the silently falling flakes in the dead-still woods. The trees bend down as if wonder-struck beneath the unaccustomed load; here and there a swaying branch shakes itself indignantly, and a cloud of snow is shed on to the earth. The tops of all the railings and walls wear great overhanging, glittering caps. It snows

in this way three or four days and nights, or longer, without a break. A light north wind begins to blow; there is a rent in the clouds, and the sun gleams down upon Davos — in its winter robes.

Davos is generally under snow from the middle of November until the middle of April. During this long time there are of course a number of days which bring fresh falls of snow and even downright snowstorms; but on the whole this period is extraordinarily rich in sunny days, the clearness and calmness of which have helped to gain for the Davos winter its world-wide renown. It is difficult to describe the splendour of one of these fine days. The whole picture is composed of only a few colours; the deep blue of the sky and of the shadows, the deep green of the firs, and the dazzling white of the snowy covering; but these colours harmonise together into wonderful beauty. Then the flashes of light in the snow-crystals are refracted, and spread out shimmering and glittering in all the colours of the rainbow. The pure, cold, invigorating air is perfectly still, and the sunshine so warm that even when the temperature in the shade is very low, one can walk and sit with comfort in the open air. In the evening, however, when the sun has disappeared in a burnished sea of fire on the horizon, and the mountain peaks are all aglow, the thermometer falls rapidly with the oncoming night, and often reaches a depth of -20^{0} C., and more.

Now that we have let the varying seasons pass, as it were, in procession before us, let us consider more closely one by one the factors which make the climate what it is. The following considerations are based primarily on the results of the observations made at the Davos Meteorological Office, together with the results of the

labours of independent observers, and also of two years' observations in the Meteorological Department of the German Sanatorium at Wolfgang. Annual Reports of the Swiss Central Meteorological Office at Zürich have afforded the principal basis for the calculation and compilation of the tables.

The Meteorological Station at Davos-Platz has existed since 1867. It is one of the best fitted first-class offices in Switzerland. All observations are made with the utmost care by the Curverein's officials and checked by the Central Office at Zurich. The results of the observations are posted daily outside the Curverein Building. Every month the above-mentioned Association publishes a coloured Weather-Chart, in accordance with the scheme drawn up by Engineer Wetzel. This gives at a glance a graphic representation of the variations of atmospheric pressure and of temperature, the intensity and duration of sunshine, the measurements of rain and snowfall, relative and absolute humidity, the direction of wind in the valley and on the heights, as well as the general character of the weather.

TEMPERATURE.

The following table gives the means for Davos of the principal factors which determine the climate of any given place. These figures are taken from the observations made three times daily at the Davos-Platz Meteorological Station during the years 1867 to 1900, with the exception that the mean duration and intensity of sunshine, as well as the daily general character of the weather, are based on a period of only five years, namely, the years 1885 to 1900.

Observations made at the Davos Meteorological Station.

Averages 1867—1900.

Month	Barometer in in.	Temperature ° Fahr.	Absolute Humidity in in.	Relative Humidity	Cloud (whole sky = 10)	Rain and Snow in in. water	Sunshine in hours	Greatest Intensity in ° Fahr.	Number of Days clear 75—100 %	slightly clouded 50—75 %	clouded 25—50 %	clouded over 0—25 %
									of the possible duration of sunshine			
January	24.843	18.7	.090	83	4.0	1.811	100.7	108	13	4	4	10
February	24.823	23.2	.104	80	4.5	2.126	111.8	118	13	3	3	9
March	24.756	27.1	.118	79	4.9	2.087	153.8	127	12	5	5	9
April	24.752	35.8	.162	76	5.6	2.244	164.0	129	10	6	5	9
May	24.855	43.9	.211	72	5.5	2.283	173.8	133	8	7	6	10
June	24.949	50.2	.272	75	5.7	4.016	177.2	136	8	5	7	10
July	24.996	54.7	.319	75	5.2	4.961	208.3	145	12	5	6	8
August	24.945	53.1	.312	81	5.0	4.921	207.1	144	14	6	4	7
September	24.981	47.7	.276	79	4.8	3.701	171.4	138	13	4	5	8
October	24.886	38.1	.183	79	5.0	2.638	135.6	124	14	4	4	9
November	24.859	29.3	.135	82	4.6	2.165	101.4	113	13	4	3	10
December	24.819	20.5	.100	84	4.7	2.402	88.5	102	13	4	3	11
Year	24.872	36.7	.190	79	5.0	35.355	1793.6	126	143	57	55	110

The Davos Valley as seen from the Muchetta

Fluela Pass and Hospice

The Rhaetian Railway near Wolfgang

In the first place, we learn from this compilation that the mean annual temperature at Davos is 2.6 ⁰ C. St. Petersburg has the same low mean yearly temperature, and in general, the isothermal line of —2.6 ⁰ extends through Northern Siberia, passing through St. Petersburg, Northern Sweden and Norway, and Iceland. Davos has, therefore, in consequence of its altitude, a fairly cold climate. A low mean temperature may be the result, however, of an equitable low temperature throughout the year or of very cold winters and hot summers. Now, Davos is situated in the midst of a great extent of land and has a genuine inland or continental climate. That is to say, its winters are cold, and contrast with comparatively warm summers. The difference between the mean temperature of the hottest and of the coldest month at Davos is 20 ⁰, at Munich 19.5 ⁰, at Breslau 20.6 ⁰, at Moscow 29.6 ⁰. These are towns with a true continental climate.

The daily fluctuations of temperature are also considerable, as appears from the following table.

Temperature ⁰ Fahr.

Days	7.30 a. m.	1.30 p. m.	9.30 p. m.	Minim.	Maxim
March 21, 1905	19.4	45.5	25.9	11.5	45.5
„ 22,	19.8	41.4	35.4	14.4	43.3
„ 23,	32.4	42.6	33.1	29.1	42.8
„ 24,	32.5	39.0	29.8	30.4	40.1
„ 25,	30.0	38.5	27.7	27.5	39.0
„ 26,	28.6	39.6	32.0	18.9	43.7
„ 27,	25.0	43.5	34.5	17.8	45.0
„ 28,	35.2	37.4	28.8	31.1	39.6
„ 29,	21.0	44.2	37.9	14.5	45.3
„ 30,	36.3	48.2	38.1	32.0	49.5
June 21, 1905	54.1	64.4	52.7	37.8	64.9
„ 22,	59.0	65.8	55.9	40.3	66.9
„ 23,	53.6	60.3	48.7	48.9	61.9

Days	7.30 a. m.	1.30 p. m.	9.30 p. m.	Minim.	Maxim.
June 24, 1905	45.7	51.6	41.0	38.3	51.8
„ 25,	47.7	57.6	44.2	33.4	57.9
„ 26,	63.1	62.8	49.6	37.8	62.8
„ 27.	51.1	62.6	51.4	42.8	63.9
„ 28,	53.4	58.1	48.9	39.4	61.9
„ 29,	59.0	71.1	55.6	38.5	71.8
„ 30,	65.7	73.0	60.1	45.1	74.5
September 21, 1905	41.4	45.1	43.7	39.4	45.7
„ 22,	42.8	47.8	44.2	40.6	48.4
„ 23,	38.8	54.7	43.5	34.2	55.6
„ 24,	44.2	56.1	46.0	37.8	57.4
„ 25,	42.4	54.5	41.5	39.7	55.6
„ 26,	43.0	50.7	44.6	36.3	52.0
„ 27,	41.7	43.0	41.7	37.9	44.8
„ 28.	37.2	52.7	41 7	33.1	53.2
„ 29,	41.7	53.4	44.1	38.1	54.0
„ 30,	39.2	47.1	42.6	36.5	49.6
December 21, 1905	10.4	24.3	19.6	8.8	25.9
„ 22,	24.4	33.3	21.6	14.2	34.9
„ 23,	19.0	30.7	19.9	15.4	32.0
„ 24,	13.5	28.6	17.4	11.3	29.5
„ 25,	18.0	33.3	19.2	13.8	34.9
„ 26,	16.9	27.3	18.3	13.8	30.2
„ 27,	14.5	25.7	15.6	11.8	28.9
„ 28,	20.7	30.2	28.6	12.0	33.3
„ 29,	28.2	34.0	22.8	25.7	36.5
„ 30,	28.8	30.7	25.2	20.3	32.0

These daily fluctuations, which are in themselves characteristic of such places as have an inland climate, owing to the absence of the equalising influence of the sea, are especially intensified at Davos, as a high mountain district, by the powerful solar radiation by day and terrestrial radiation by night. This is particularly noticeable in calm, fine weather, as at such times both kinds of radiation reach their maximum.

In the following compilation we compare the Davos maxima and minima for the year 1903 with the corresponding figures of two other alpine meteorological stations.

Month	Davos [1560 m]		Julier [2237 m]		Maloja [1810 m]	
	Min.	Max.	Min.	Max.	Min.	Max.
January	1.4	38.7	—1.1	35.2	5.9	37.8
February	6.3	42.4	5.0	35.6	—0.4	36.3
March	—1.1	44.2	6.4	40.8	2.8	44.2
April	24.8	56.3	15.6	46.8	19.8	50.0
May	26.6	63.9	12.2	55.0	21.9	52.5
June	34.2	78.4	24.8	62.8	—.—	—.—
July	41.7	71.0	32.0	77.4	40.3	73.4
August	34.9	71.6	27.7	62.6	38.3	63.0
September	31.5	72.7	24.1	57.2	31.3	65.1
October	22.8	58.5	17.6	48.2	25.2	48.9
November	14.4	51.8	7.9	39.2	13.8	42.4
December	4.6	43.0	3.2	33.8	—.—	—.—

According to the foregoing table, Davos exhibits on the average greater differences of temperature than even much higher lying places. This is closely connected with two of the greatest advantages of Davos, namely, with the very large number of clear, cloudless days and the very great prevalence of atmospheric calm.

The lowest temperature of the last twenty years was recorded in the night of January 1st., 1905, when the thermometer at the Meteorological Office registered —32° C. In general, however, the temperature very rarely sinks below —20° C., and even then the days, in consequence of the dryness and stillness of the air, and the intensity of the sunshine, are beautifully fine.

We now give lists of the coldest and hottest days of the last ten years, together with the fluctuations of temperature each time of observation.

	Coldest days			*° Fahr.*	*Hottest days*			
Year	Day	Time			Day	Time		
		7.30 a.	1.30 p.	9.30 p.		7.30 a.	1.30 p.	9,30 p.
1894	4. I.	—10.1	14.0	—0.4	25. VII.	60.1	82.2	61.2
1895	31. I.	—14.8	13.8	7.2	26. VII.	57.0	79.7	56.7
1896	10. I.	— 3.3	4.6	—4.7	10. VII.	57.6	76.8	52.7
1897	4. I.	— 6.8	21.6	9.0	30. VI.	60.6	81.7	68.1
1898	22. XII.	— 1.8	10.0	—3.3	27. VIII.	55.0	78.6	64.2
1899	11. XII.	— 6.2	8.6	—1.5	22. VII.	57.2	77.5	59.2
1900	5. III.	— 5.8	18.7	0.7	16. VII.	59.4	79.5	58.8
1901	15. II.	—16.6	9.3	—12.6	10. VIII.	55.0	74.3	62.6
1902	11. III.	— 0.4	30.9	11.8	7. VII.	62.6	77.0	62.1
1903	17. II.	— 4.0	19.6	3.7	9. VIII.	60.1	74.5	57.6
1904	27. II.	— 1.8	25.5	5.9	21. VII.	61.9	72.1	60.3
1905	2. I.	—22.7	—7.4	—17.0	2. VII.	64.8	80.6	63.3

It will also be seen from this table that the evening temperatures are comparatively low, even on the hottest days. It is a mistake to think that the summer at Davos is particularly warm. Even when the temperature is high, the refreshing valley-wind makes it pleasant to be out of doors. The nights are never close. In the night between the 24th. and 25th. of July, 1894, the hottest days during the past twenty years, the mercury sank to 9.4° C., and on the following night to 12.8° C.

The summer temperatures of the Davos valley do not materially differ from those of other favourite alpine summer resorts; in proof of which statement we compare in the following table the temperatures of the summer months at Davos with those of some popular alpine summer health-resorts.

	Davos		Andermatt		St. Moritz		Grindelwald		Engelberg		Schuls	
	June *° Fahr.*											
	1901	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*
Monthly average	51.8	48.9	50.7	47.8	51.3	47.8	54.9	52.0	55.4	52.7	56.7	54.1
Minima	33.1	34.2	30.0	32.0	33.4	34.2	37.4	39.9	36.5	37.0	38.5	35.6
Maxima	78.6	73.4	70.7	73.0	71.4	67.3	75.9	76.3	77.5	76.6	76.8	79.7

	Davos		Andermatt		St. Moritz		Grindelwald		Engelberg		Schuls	
	July											
	1901	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*	*1901*	*1902*
Monthly average	53.6	55.4	53.1	54.1	53.1	54.7	58.1	57.4	58.3	58.8	58.5	61.0
Minima	39.7	41.7	40.6	37.0	40.6	38.8	48.7	44.2	48.6	46.6	49.3	49.5
Maxima	72.1	77.0	68.4	81.0	69.1	76.5	76.5	80.2	76.8	80.6	75.6	85.1
	August											
Monthly average	53.1	52.3	52.0	51.8	52.9	51.6	56.1	55.6	56.1	55.6	59.2	58.6
Minima	38.3	34.9	35.2	36.5	38.5	39.0	39.7	39.0	41.7	41.0	45.1	44.6
Maxima	74.3	71.6	73.8	71.2	70.5	68.0	75.2	77.0	72.5	74.5	82.8	78.3

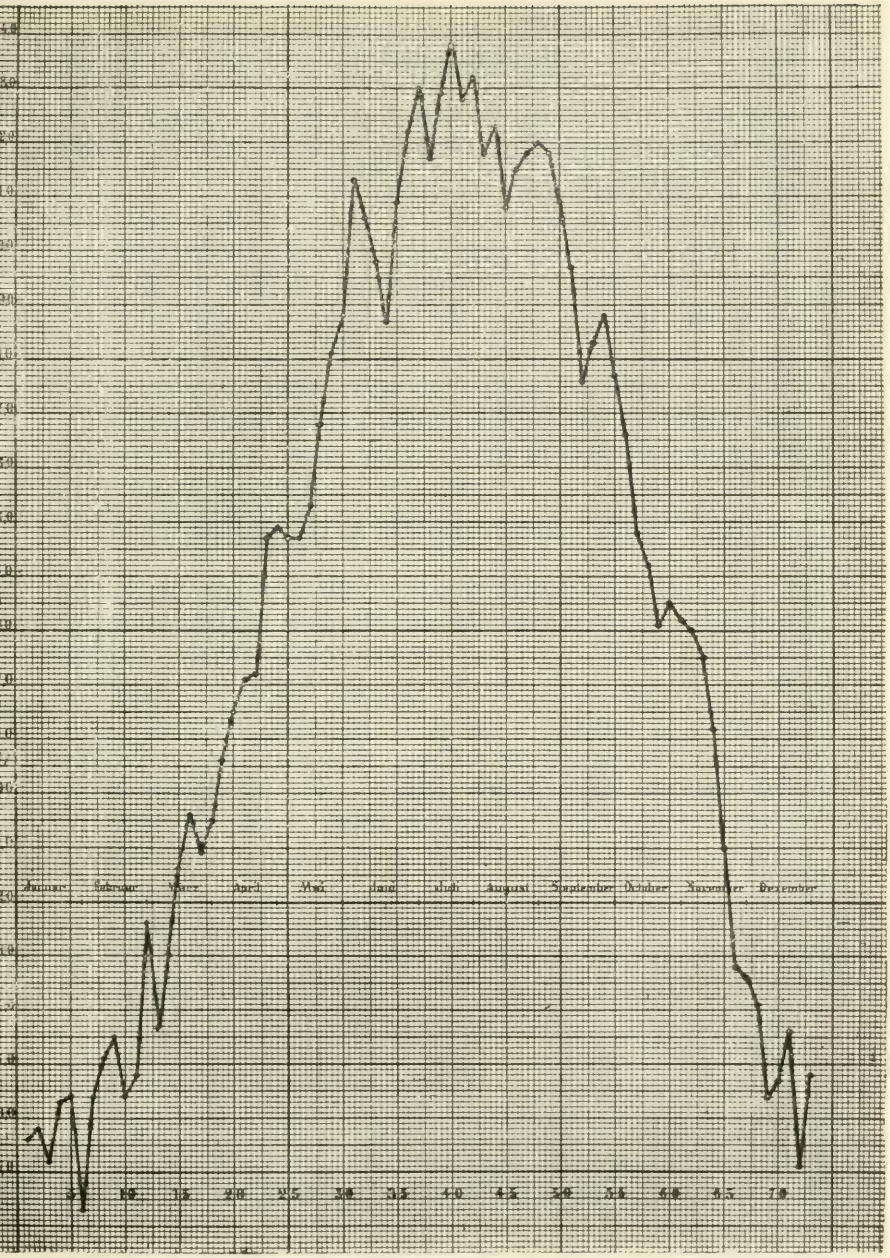
In order to be able to give an idea of the yearly range of temperature at Davos, the pentad averages of the past ten years have been calculated, and will be found in tabular form on page 118. The chart on page 119 will show even more clearly at a glance the variations of temperature throughout the year.

A period of ten years is probably insufficient to enable one to know with exactitude the movements of the temperature throughout the year; but in the meantime it will serve quite well as an approximate guide. As will be seen from the temperature curves, the lowest temperature of the year, the annual minimum, falls between the 26th. and 30th. of January, and the maximum between the 15th. and 19th. of July. Twenty-seven pentad averages fall below freezing point, those from January 1st. to March 31st. and from November 17th. to December 31st. At Berlin (on the basis of observations extending over 35 years) the number of pentad averages under 0° C. is only five, those under 10 C. 33; above 15 C. 22. At Davos 17 pentads have their mean above 10°, but in none does it reach 15° C.

If we examine the progress of the temperature at a period when it is rising, to see how often there is a pentad with temperature lower than or the same as the foregoing,

Five-day averages (pentads) of temperature (1894—1903) at Davos-Platz.

Pentad		Date	°Fahr.	Pentad		Date	°Fahr.	Pentad		Date	°Fahr.
1.	January	1.— 5.	20.5	26.	May	6.—10.	40.5	51.	September	8.—12.	49.5
2.	„	6.—10.	20.8	27.	„	11.—15.	41.5	52.	„	13.—17.	45.7
3.	„	11.—15.	19.8	28.	„	16.—20.	44.2	53.	„	18.—22.	46.9
4.	„	16.—20.	21.7	29.	„	21.—25.	46.6	54.	„	23.—27.	47.8
5.	„	21.—25.	21.9	30.	„	26.—30.	47.8	55.	„	28.— 2.	45.9
6.	„	26.—30.	18.1	31.	June	31.— 4.	52.3	56.	October	3.— 7.	43.9
7.	February	31.— 4.	21.9	32.	„	5.— 9.	51.1	57.	„	8.—12.	40.6
8.	„	5.— 9.	23.2	33.	„	10.—14.	49.6	58.	„	13.—17.	39.6
9.	„	10.—14.	23.9	34.	„	15.—19.	47.7	59.	„	18.—22.	37.6
10.	„	15.—19.	21.9	35.	„	20.—24.	51.6	60.	„	23.—27.	38.3
11.	„	20.—24.	22.6	36.	„	25.—29.	54.0	61.	„	28.— 1.	37.8
12.	„	25.— 1.	27.7	37.	„	30.— 4.	55.4	62.	November	2.— 6.	37.4
13.	March	2.— 6.	24.3	38.	July	5.— 9.	53.1	63.	„	7.—11.	36.5
14.	„	7.—11	26.6	39.	„	10.—14.	55.2	64.	„	12.—16.	34.2
15.	„	12.—16.	29.5	40.	„	15.—19.	56.8	65.	„	17.—21.	30.2
16.	„	17.—21.	31.3	41.	„	20.—24.	55.0	66.	„	22.—26.	26.2
17.	„	22.—26.	30.0	42.	„	25.—29.	55.8	67.	„	27.— 1.	25.9
18.	„	27.—31.	31.1	43.	August	30.— 3.	53.2	68.	December	2.— 6.	25.0
19.	April	1.— 5.	33.1	44.	„	4.— 8.	54.1	69.	„	7.—11.	21.9
20.	„	6.—10.	34.7	45.	„	9.—13.	51.4	70.	„	12.—16.	22.5
21.	„	11.—15.	35.8	46.	„	14.—18.	52.7	71.	„	17.—21.	24.1
22.	„	16.—20.	36.0	47.	„	19.—23.	53.2	72.	„	22.—26.	19.6
23.	„	21.—25.	40.5	48.	„	24.—28.	53.6	73.	„	27.—31.	22.6
24.	„	26.—30.	40.8	49.	Sept.	29.— 2.	53.2				
25.	May	1.— 5.	40.5	50.	„	3.— 7.	51.6				


Januar
Februar
März
April
Mai
Juni
Juli
August
September
Oktober
November
Dezember

and also, at a period when the temperature is falling, to see how often a pentad is higher than or the same as the one preceding, we find that there are breaks in the progressive fall and rise — so-called relapses of heat and cold.

Relapses of cold generally occur at Davos from the 15th. to the 24th. of February, from the 2nd. to the 11th. of March, from the 22nd. to the 31st. of March, from the 1st to the 10th. of May, and, especially noticeable, in the first half of July. Considerable warm relapses take place in the second half of September and of October, and also in the middle of December.

RELATIVE AND ABSOLUTE HUMIDITY

The amount of water-vapour contained in the atmosphere is determined by its absolute and relative humidity. When we speak of the absolute amount of humidity present in the air, we mean the tension of the water present in the form of vapour in the air at any given place of observation, as measured by the number of millimetres of mercury which it will support. This corresponds almost exactly to the number of grammes of water-vapour contained in a cubic metre of air. The relative humidity expresses the amount of moisture present as a percentage of the quantity necessary at the prevailing temperature for the complete saturation of the air, and this tells us at once how far the existing state of humidity is from the saturation-point. The distribution of absolute humidity is to a high degree dependent on the temperature, for the higher this latter is, so much the more vapour can the air take up. On the other hand, the relative humidity affords small values when the temperature is high, and *vice versa;* for, the higher the temperature, so much the more vapour is required to bring

about saturation. From these considerations we have no difficulty in arriving at the conclusion (which is in accordance with the actual conditions) that in Davos the absolute humidity must be small, and the relative humidity great.

The observations recorded during the years 1867-1900 give a mean absolute humidity for Davos of 4.82 mm., and a mean relative humidity of 79%. For Berlin the corresponding figures are 6.6 mm. and 74%. The mean relative humidity at Zurich is 78%, and at Lugano 75%.

The daily variations of humidity are in general closely connected with those of the temperature: the absolute humidity is at its maximum at the warmest time; but the relative humidity has for the most part an opposite movement to that of the temperature. In illustration of the aforesaid we give here the means of the daily observations made at the Davos Meteorological Office for various portions of the year 1905.

Year 1905	Relative humidity in %			Absolute humidity in inch.		
	7.30 a.m.	1.30 p.m.	9.30 p.m	7.30 a.m.	1.30 p.m.	9.30 p.m.
March 21	66	28	75	.069	.085	.105
„ 22	79	47	84	.084	.122	.174
„ 23	88	49	98	.162	.134	.185
„ 24	96	60	95	.178	.143	.157
„ 25	91	56	82	.152	.131	.125
„ 26	71	59	85	.111	.144	.154
„ 27	68	35	82	.091	.099	.164
„ 28	86	62	70	.177	.139	.111
„ 29	71	28	65	.080	.081	.149
„ 30	82	49	81	.176	.165	.187
June 21	70	47	84	.293	.286	.335
„ 22	65	50	82	.323	.318	.367
„ 23	75	37	75	.307	.195	.257
„ 24	73	55	91	.224	.262	.235
„ 25	67	40	92	.265	.286	.267
„ 26	56	36	67	.280	.319	.309
„ 27	77	48	90	.289	.394	.340

Year 1905	Relative humidity in %			Absolute humidity in inches		
	7.30 a.m.	1.30 p.m.	9.30 p.m	7.30 a.m.	1.30 p.m.	9.30 p.m.
June 28	77	67	95	.314	.390	.330
„ 29	62	43	64	.311	.326	.339
„ 30	48	39	73	.375	.403	.378
September 21	94	80	90	.246	.242	.258
„ 22	94	84	93	.260	.279	.271
„ 23	89	52	92	.211	.300	.260
„ 24	81	46	95	.237	.298	.295
„ 25	92	52	94	.249	.281	.248
„ 26	83	63	89	.232	.276	.263
„ 27	93	85	93	.246	.235	.246
„ 28	92	45	70	.205	.263	.220
„ 29	94	45	68	.249	.255	.231
„ 30	88	65	89	.211	.247	.243
December 21	89	58	70	.062	.076	.074
„ 22	75	52	83	.098	.099	.096
„ 23	94	61	83	.097	.105	.089
„ 24	79	48	73	.063	.076	.070
„ 25	74	46	77	.073	.088	.080
„ 26	84	59	82	.079	.088	.082
„ 27	81	55	76	.068	.074	.067
„ 28	82	63	78	.091	.106	.122
„ 29	96	68	86	.148	.133	.105
„ 30	94	80	91	.149	.137	.123

The variations in humidity throughout the year are also very closely allied to those of the temperature. The absolute humidity varies in the same direction as the temperature, and reaches its maximum at Davos in July. The relative humidity reaches its minimum in summer (in the months of May, June and July), and its maximum in winter.

It would be a mistake to infer from the high relative humidity that Davos has a damp climate and that residence there has an effect on the human system corresponding to that of such a climate. The reverse is the case: the Davos climate promotes the removal of water through the lungs and skin, and, for this reason, metabolism also.

This is especially true of the cold winter air with its diminished absolute humidity. In the warm summer months this factor is of less importance, and in its place longer walks must be resorted to for producing a stimulation of metabolism.

In the cold months the air inhaled out of doors has a temperature of 0° C. or less. In the bronchia it is so far warmed that when expired it falls only a little short of the temperature of the body. It matters but little whether the air before inspiration is 0° or 10°; the expired air has almost always a temperature of 30° C. and more. The cold, absolutely very dry air becomes, by being warmed in the lungs, of a considerably lower relative humidity. The favourable results for the invalid are shown in the increased feeling of thirst, cessation of night sweats, and a good appetite.

In the well-protected, southward-facing *Liegehallen* (shelters for the cure) the air is relatively very dry on fine, still winter days. The relative humidity sometimes sinks — taking only such days as are free from the "föhn" wind — to 35 %. The conditions are very similar to those which prevail in a heated room. If the temperature of the air before the room is heated be 3°, and afterwards 13°, the original relative humidity of 70 % must sink to about 40 %, the opportunity for the development of water-vapour being very small.

Under the circumstances just mentioned, an increased evaporation of water through the skin is to be regarded as certain. It may be thought that as a result of this increased removal of water-vapour from the lungs and skin in the high mountains, with the diminution of warmth thus involved, the cold must be very much felt. This is, however, not by any means the case. In the first place, increased

evaporation through the skin only takes place when the surrounding air becomes warmer. Then, too, the actual enhanced removal of heat through lungs and skin is more than compensated by the increased amount of nourishment taken; and, finally, the thin dry air is a very bad conductor of heat. That is why one feels comfortable at Davos in a room heated up to 16° C., whereas in the lowlands one requires from 18° to 20°.

CLOUD AND SUNSHINE.

As we learn from the table on page 112, five-tenths of the sky is on the average clouded over at Davos. That is to say, Davos is distinguished by unusual clearness of the atmosphere and by a large amount of sunshine.

The high mountains differ in general from the lowlands and sea-level in having less cloud and less rain and snow, the lower-lying areas being more favourable to the accumulation of moisture. In addition to that, the particles of salt which are floating in the air at sea, and the smoke in the great cities, contribute a great deal towards the condensation of water-vapour, and therefore to the formation of cloud and fog. Davos is specially favoured by its situation in the midst of the Rhaetian highlands. Before they can reach the Davos Valley, the moisture-laden air-currents come in contact with the great mountain-walls all round, and deposit thereupon a large portion of the water which they contain; so that while Davos has a record of 50 % of cloud, the south of England, for example, has 79 %, Berlin 63, Munich 65, Vienna 57 %. Lower figures are to be found in southern countries. In order to enable Davos to be compared in this respect with other

parts of Switzerland, we give here the percentage of cloud at other Swiss places for the years 1902 and 1903.

	1902	1903		1902	1903
Basle	6.8	7.2	Lugano	4.8	4.4
Berne	6.9	7.2	Seewis	6.2	6.4
Zurich	6.3	6.5	St. Moritz	5.1	5.3
Montreux	5.6	6.0	Rigi-Kulm	5.9	6.1
Lucerne	6.5	6.9	Davos	5.1	5.4

According to these figures, Davos and St. Moritz, both in the heart of the Graubünden highlands, are only excelled in clearness of the sky by sunny Lugano. Now, whereas in the places situated in the lowlands the minimum of cloud is recorded in summer and the maximum during the winter months, the conditions in the highlands are exactly the reverse. In Davos the greatest number of fine days generally falls within the months of January, February, November and December.

In the following table we compare the percentage of cloud at Zurich and Davos for each month of the year 1902.

	Zurich	*Davos*		*Zurich*	*Davos*		*Zurich*	*Davos*
January	6.8	3.9	May	4.0	4.8	September	7.1	6.0
February	6.6	4.4	June	5.6	6.0	October	7.9	5.2
March	6.9	5.8	July	4.6	5.6	November	8.0	4.3
April	5.7	5.2	August	4.8	4.6	December	7.7	4.9

There is most cloud, therefore, at Davos in June and least in January. It will be seen at once that it is a great advantage to have the cold winter days made milder by the greatest possible amount of sunshine.

Fog of any extent is very rare at Davos. Now and again a part of the fog floating in the Prättigau is blown by the wind over the mountain-saddle at Wolfgang into our valley. But the valley-wind always prevailing at such times quickly drives it away beyond Davos, and it is, more-

over, seldom that it comes down to the bottom of the valley. Limited local mists are sometimes formed on cold nights in the neighbourhood of the Lake and the Landwasser; but no general importance can be ascribed to these.

In close connection with the proportion of cloud stands the duration of sunshine. Since 1886 the daily duration of sunshine has been measured at Davos by means of the "Autograph". In the following table the duration of sunshine actually recorded is compared with the theoretically possible duration:

Averages, 1885–1900:

	Possible duration of sunshine. hours	Actual duration of sunshine. hours	Percentage of possible duration
January	181.6	100.7	55.4
February	206.0	111.8	54.3
March	285.5	153.8	53.8
April	325.8	164.0	50.3
May	362.9	173.8	47.9
June	367.5	177.2	48.2
July	373.3	208.3	55.8
August	354.0	207.1	58.5
September	300.2	171.4	57.1
October	238.8	135.6	56.8
November	186.8	101.4	54.3
December	170.6	88.5	51.8
Total	3353.0	1793.6	53.5 per cent

Davos, as a valley shut in by high mountains, has a less possible duration than that of places situated in the midst of level country. It amounts to 3353 hours in the year, while for Zurich and Lugano, for example, 4120 and 3956 hours respectively are calculated. In spite of this, however, the actual duration at Davos and at Zurich is almost the same, as will be seen from the following table,

which gives the daily duration of sunshine at several places in Switzerland for the year 1901, and also the possible daily duration at Lugano, Zurich, and Davos. For Montreux the possible duration has not yet been calculated

Daily Duration of Sunshine in Hours (1901).

	Lugano		Zurich		Davos		Montreux
	actual	*possible*	*actual*	*possible*	*actual*	*possible*	*actual*
January	5.01	7.59	2.33	7.83	3.94	5.85	1.97
February	8.70	8.93	6.40	9.25	4.05	7.35	4.50
March	3.58	10.87	3.05	10.97	3.68	9.20	2.18
April	5.83	12.36	5.75	12.83	5.27	10.86	4.27
May	7.68	13.55	8.85	14.22	5.64	11.70	6.90
June	8.70	13.93	7.27	15.06	6.23	12.25	6.38
July	8.22	13.71	8.35	14.29	6.34	13.00	7.08
August	8.81	12.96	7.10	13.90	7.23	11.41	6.36
September	4.61	11.43	3.63	11.70	4.75	10.00	3.73
October	3.79	9.67	2.01	9.83	4.04	7.70	2.04
November	4.15	7.90	1.55	8.23	3.65	6.22	2.20
December	3.45	7.03	1.35	7.32	2.34	5.50	1.64

According to the foregoing figures, the mean daily duration of sunshine at Davos in the year in question was 4.76, for Zurich 4.80, and for Lugano 5.96, while the possible duration for Davos was 9.18, for Zurich 11.29, and for Lugano 10.83 hours. Davos had 51.8%, Zurich 42.5% and Lugano 55% of the possible sunshine.

The reader will get some idea from the following table of the fluctuations in the duration of sunshine from year to year.

It must also be mentioned as a further advantage that when the sun rises over the mountains at Davos, it is already high in the heavens; its rays strike the earth at a fairly obtuse angle and are at once much more powerful than in the plains, where in the early morning hours the

Duration of Sunshine at Davos.

Month:	Year:									
	1896	*1897*	*1898*	*1899*	*1900*	*1901*	*1902*	*1903*	*1904*	*1905*
January	119.5	76.0	130.5	72.0	51.5	114.0	106.7	128.4	111.6	101.5
February	137.2	85.0	81.1	146.5	78.0	114.5	80.9	118.3	85.0	100.0
March	122.7	110.0	127.1	178.7	124.1	114.1	127.2	181.3	140.5	115.0
April	143.4	143.0	137.8	132.7	152.4	158.1	154.5	95.4	151.7	160.7
May	202.4	162.0	136.7	158.3	141.4	177.2	106.5	226.3	216.6	175.9
June	160.2	223.0	154.1	184.2	157.6	188.8	167.3	156.3	199.9	195.5
July	193.2	179.0	204.8	190.6	206.4	194.9	258.5	168.4	229.1	239.4
August	116.5	202.0	251.7	248.3	197.5	224.2	203.1	222.3	215.1	192.9
September	149.9	153.0	234.2	141.8	185.8	144.5	223.9	206.1	119.1	163.9
October	131.4	161.0	136.0	170.6	165.7	126.7	104.3	124.4	135.8	100.4
November	94.7	152.0	96.4	153.5	89.8	109.6	126.6	98.3	118.4	63.4
December	46.5	121.0	106.1	72.3	89.0	74.0	88.7	97.9	105.0	121.1
Total	**1618.1**	**1767.0**	**1796.5**	**1849.5**	**1639.2**	**1740.5**	**1748.2**	**1823.3**	**1827.8**	**1729.7**

rays fall very obliquely. And in the alpine climate solar radiation is a factor of decided importance.

By solar radiation we understand the general effect of the sun's rays falling on a given area. This is estimated in accordance with the warmth they produce. In the uppermost confines of the atmosphere the sun developes, according to Violle's calculations, 2.54 units of heat. On their passage through the atmosphere the rays lose part of their waves by absorption into the air and the water-vapour. Their power, therefore, of warming objects upon which they shine is lessened in proportion to the thickness of the stratum of air through which they pass. On the summit of Mont Blanc the sun's rays have a power of only 2.29 units. That is to say, 6% of the solar radiation has already been lost by absorption. At a height of 3000 metres the loss amounts to 11 %, at 1500 metres (the elevation of Davos) to 15%, at 1200 metres to 21%, at sea-level to 31%.

Davos nival flora I. (Natural size): l. limestone, p. r. primitive rock.
a) **Dianthus glacialis** ***Hänk.*** 2600 m. p. r. Schiahorn. – *b)* **Lloydia serotina** ***Rchb.*** 2760 m. p. r. Hintere Thiejerfluh. – *c)* **Viola calcarata** ***L.*** **nivalis.** 2655 m. l. Küpfenfluh. – *d)* **Primula integrifolia** ***L.*** 2636 m. p. r. Strela. – *e* **Gentiana verna** ***L.*** **„imbricata".** 2713 m. l. Schiahorn. – *f)* **Ranunculus glacialis** ***L.*** 2654 m. p. r. Körbshorn. – *g* **Chrysanthemum alpinum** ***Lam.*** 3047 m. p. r. Bocktenhorn. – *h)* **Poa laxa** ***Hänk.*** 3047 m. p. r. Bocktenhorn.

We may therefore say that the radiation at Davos is 17 % more powerful than that of places at sea-level. The Alpine light is more intense, the calorific power of the sun greater on the mountains than on the plains.

One can hardly get an adequate idea of the power of the sun's rays on the high mountains if one has not felt them on one's own body.

The maximum intensity is shown in the table on page 126 in averages of 16 years' observations. The following short compilation is intended to show the amount of solar radiation on each day of the coldest and hottest months at Davos, and also how solar and atmospheric temperature stand related.

	January		July	
	Atmospheric Temperature in ° Fahrenheit	Solar Radiation	Atmospheric Temperature in ° Fahrenheit	Solar Radiation
1.	6.3	88	53.4	133
2.	17.4	68	60.8	136
3.	33.1	73	63.0	140
4.	30.6	82	58.3	133
5.	33.4	102	59.2	144
6.	25.0	91	53.6	106
7.	26.8	97	43.9	111
8.	24.4	95	36.9	64
9.	34.2	99	39.4	77
10.	39.0	100	44.4	122
11.	36.1	77	53.6	127
12.	23.0	43	61.0	136
13.	12.0	82	52.3	117
14.	9.1	91	55.6	135
15.	11.5	93	60.3	142
16.	9.1	88	61.9	149
17.	9.9	90	59.2	126
18.	8.4	93	59.4	118
19.	9.9	91	59.2	118
20.	11.3	97	46.0	73
21.	10.9	95	48.2	120

	January		July	
	Atmospheric Temperature in ° Fahrenheit	Solar Radiation	Atmospheric Temperature in ° Fahrenheit	Solar Radiation
22.	10.8	93	50.2	135
23.	14.9	99	58.6	144
24.	16.7	111	46.0	73
25.	17.6	97	46.8	127
26.	28.0	108	54.3	133
27.	28.8	106	48.2	106
28.	27.9	106	49.3	124
29.	23.2	108	56.3	135
30.	18.9	100	46.9	97
31.	18.9	100	44.8	133

In winter the solar radiation at Davos is remarkably powerful. While at Paris it is five times weaker in December than in July, at Davos it amounts to more than a half, as may be seen from the following averages of the daily maximum in 1903.

Means of Daily Maximum of Solar Intensity in ° F.

January	February	March	April	May	June
86	100	111	118	124	131

July	August	September	October	November	December
133	124	122	108	93	97

Whereas in the winter months the intensity of the sun is considerably greater than in the lowlands, in summer the reverse seems to be the case.

The powerful solar radiation during the cold months, occasioned by complete absence of wind and the refraction of the rays by the snow, makes it possible to sit or walk for hours in the open air without being more warmly clothed than when indoors. In February and March the sun is occasionally really too hot, so that while "doing the cure" one is glad to be in the shade. This extraordinary warmth leads ever and again to the same inference; if it is so hot at Davos even in February, then it must be

unbearably hot in July. As a matter of fact, however, the heat of the sun is never felt so much as just in February and March. In summer there is no longer the refracted heat from the snow: the heat is, on the contrary, taken up by the soil. And then, too, a cooling valley-wind is always blowing during fine weather.

It should also be pointed out that it is only the sunshine which makes it so pleasant to be out of doors during the cold months. The atmospheric temperature is not increased to any extent in the sunshine, — a fact which the great diathermancy of the atmosphere would in fact lead us to infer. The difference between the temperature of the air through which the sun is shining and the temperature in the shade is at most only a few degrees.

Concerning the intensity of the light, the bactericidal properties of which has in recent years come more and more to the front, there are no exact observations available so far as Davos is concerned. It is, however, certain that the alpine light is richer than that of the lowlands in the ultra-violet, chemically active rays. For it is especially these rays, which are the most easily refracted, that are absorbed in the lowest strata of the atmosphere.

What effect the radio-activity of the air (which according to the most recent experiments is considerably greater on the mountains than in the lowlands) has upon the human system, is at the present time an open question.

RAIN AND SNOWFALL.

The amount of rain and snow which falls in the Davos valley is comparatively small. The mean amount is 35.355 in. That is to say, the rain which falls during the course of a year, and the water contained in the snow, hail, etc., would

cover the ground to a height of 35.355 inches, supposing it perfectly even, and if the water neither evaporated nor oozed away.

In the following table we compare the mean amount of rain and snowfall of a number of Swiss stations (mostly means of the years 1864-1900):

Station	Altitude above sea [metres]	Annual average Rain and snow [inches]	
Lugano	275	66.970	
Basel	278	30.473	
Montreux	380	43.662	
Zurich	480	45.119	
Lausanne	553	39.095	
St. Gallen	703	54.411	
Engelberg	1021	67.876	
Klosters	1209	47.363	
Leysin	1450	50.395	Average 1901 and 1902
Davos	1560	35.355	
Rigi-Kulm	1787	65.592	
Sils-Maria	1811	37.836	
St. Moritz	1841	39.056	Average 1901 and 1902
Bevers	1970	32.678	
Bernhardin	2070	88.821	

Basle, which is well known to have an exceptionally small rainfall, is the only place which shows an amount to any extent less than that of Davos. The figures for the remainder of the Swiss lowlands are very considerably higher.

Even the Prättigau, which forms one of the boundaries of the Davos Valley, has a very high rain and snowfall. This is represented in the table by Klosters with 47.363 in. In the Upper Engadine (St. Moritz, Sils-Maria) the annual snow and rainfall is rather greater than that of Davos.

The Lower Engadine, on the other hand, has even less than Davos.

The maximum at Davos comes in the months of July and August; the minimum in the winter months: January, February, November, and December. On the average, rain or snow falls on 140 days during the year (the slightest falls are included in this reckoning), there being snow on half this number of days. Hail is rather rare, occurring only about three times in the year. The number of thunderstorm naturally varies a great deal, but they may be regarded as averaging 12 in the course of the year. In general, taking the average of thirty years' observations, we may count upon 203 fine, 52 medium good, and 110 bad days. Of these the winter claims 102 fine, 22 medium, and 58 bad days.

The height of the total snowfall of the year, measured as freshly fallen, varies between 3 and 8 metres. The average yearly height of snow amounts at Davos, on the basis of fourteen years' observation, to 5.029 metres. The district lies in the winter months under a covering of hardened snow measuring, in years when there is little snowfall, two feet, and in years of abundant snowfall more than six feet.

The freshly-fallen, damp snow changes in quite a short time into a substance dry like dust, which cannot be squeezed into balls. For rather more than half the year this covering contributes very largely to the purity of the air. On the paths it is pressed down by means of snow-rollers, and one walks on it as on a hard road. It is true that it often takes a long time in spring to melt such great quantities of snow. The process generally lasts throughout April and during a part of May, especially as fresh snow continually falls in the meantime. Exceptionally (and

particularly when the föhn wind blows strongly for any length of time), the whole of the snow will disappear in three weeks. A rapid thaw of this kind occurred, for example, in the spring of 1904.

This transition period has of course, here as elsewhere, its shady side. The roads and paths are for a time unfavourable, although the water goes away fairly quickly, owing to the permeable nature of the soil and the prevalent gradients. There is no trace of any notable general influence of the snow-melting on the absolute and relative humidity, and with a little care the invalids get through this short period without any evil effects whatever.

ATMOSPHERIC PRESSURE AND WIND.

The mean height of the barometer at Davos is 631.8 mm. Owing to the elevation, the fluctuations in the atmospheric pressure are comparatively small. During the past twenty years the highest reading was 646.4, the lowest, 605.8 mm. Both observations were made in the year 1903, on February 30th. and November 29th. respectively. The atmospheric pressure varies as a rule between 620 and 640 millimetres. Wind observations at Davos include not only the air-currents in the valley, but also the wind on the heights above. The force of the wind in the valley is measured by Wild's wind scale. The direction of the wind above the mountain-tops is ascertained by a Leupold vane set up on the Bremenbühl, a summit (7420 feet high) of the Scaletta chain, visible from Davos.

It goes without saying that general movements of the atmosphere must be more or less diverted and weakened by the high mountain complex which surrounds the valley. As a matter of fact, the wind over the mountain summits

and the wind in the valley very often blow in quite different directions, as may be seen from the following comparison:

			Wind on summits	Wind in Valley				Wind on summits	Wind in Valley
March	21,	1905	S	NE	September	21,	1905	+	calm
„	22,	„	S	calm	„	22,	„	+	NE
„	23,	„	S	„	„	23,	„	SW	calm
„	24,	„	NE	NE	„	24,	„	S	„
„	25,	„	NE	NE	„	25,	„	SW	„
„	26,	„	SW	NE	„	26,	„	SW	„
„	27,	„	S	calm	„	27,	„	+	„
„	28,	„	+[1])	NE	„	28,	„	S	„
„	29,	„	S	NE	„	29,	„	SW	„
„	30,	„	S	calm	„	30,	„	SW	„
June	21,	„	N	„	December	21,	„	NE	„
„	22,	„	N	„	„	22,	„	NE	„
„	23,	„	W	E	„	23,	„	NE	„
„	24,	„	NE	NE	„	24,	„	NE	„
„	25,	„	SW	calm	„	25,	„	S	„
„	26,	„	S	„	„	26,	„	NE	„
„	27,	„	SW	NE	„	27,	„	S	„
„	28,	„	S	calm	„	28,	„	S	„
„	29,	„	SW	SW	„	29.	„	S	„
„	30,	„	S	SW	„	30.	„	+	NE

Instead of the various directions of the wind prevailing over the mountain-tops, we generally find, therefore, in the valley, either no wind at all, or a north-east wind, which latter is the real Davos valley-wind. The valley-wind, which is a characteristic of all mountain-valleys, and which is particularly noticeable during fine weather, blows normally upward, towards the mountains, by day, and downward to the lower valleys, at night. These currents originate from the redistribution of pressure which arises in a column of air warmed from beneath.

[1]) + vane hidden by clouds.

Now at Davos the valley-wind, departing from the general rule, blows down the valley, from north-east to south-west, during the daytime. In order to understand this phenomenon we must remember that the Landwasser Valley is a valley-torso, having been cut short at its upper end by the powerfully erosive Landquart. In the deep Prättigau, which runs almost at a right angle to the Davos Valley, the lower strata of the air become very much warmed on fine days, and the atmospheric pressure consequently increases in the high-lying parts of the air-column. An intensified local wind springs up above the Prättigau, and the air flows through the dip at Wolfgang and into the Davos Valley.

This peculiarity of the valley-wind confers upon Davos an inestimable superiority. The north-east wind does not in the least inconvenience the invalids who are lying out on south balconies. If it blew as a normal valley-wind, from the south-west, it would probably be impossible for invalids to remain in the open air, especially on cold days in autumn and summer. On warm days, on the other hand, this wind contributes very much to the pleasant cooling-down of the valley. The valley-wind is most frequent in June, and least frequent in December, this being the month in which the solar radiation is least intense. During the whole winter, indeed, this wind is much less frequent and also slighter, as, in consequence of the enormous covering of snow, the warming of the lower strata of air no longer takes place. In fact, from December till March there is generally an absolute calm on fine days.

This large prevalence of windless days in winter is one of the great advantages of Davos. As far as we know, there is no other alpine health-resort for lung-patients which excels it in this respect. The following table gives

the number of observations of calm weather at a number of places in Switzerland. They are the means of three records daily during the years 1901 and 1902.

Basle	(278 m.): 117	Engelberg	(1021 m.): 451
Zurich	(493 m.): 435	Sils-Maria	(1712 m.): 328
St. Gallen	(703 m.): 648	St. Moritz	(1841 m.): 32
Lugano	(275 m.): 986	Arosa	(1835 m.): 778

Davos (1560 m.): 828.

On days when the air is in motion, the north-east current, already spoken of as the valley-wind, chiefly prevails. In fact, 85% of the wind-observations give north-east. The remaining 15 % is divided between south-west and south (10 %) and north, east, and west (5 %).

The velocity of the wind seldom exceeds gradient 1 of Wild's scale (0.5 to 5 metres per second), and then for the most part only when there is a snowstorm, and now and again during "föhn" weather.

By "föhn" wind is meant the warm and dry descending wind, the origin and general history of which has been principally studied in Switzerland. We find such air currents not only among the Alps, but also in the Vosges, in the Riesengebirge, in Sicily, Algiers, Spain,Greenland, New Zealand, South Georgia, Japan and North America.

So far as the Alps are concerned, we have to bear in mind two main divisions: there is the south föhn on the north side and the north föhn on the south side. In respect to Davos, therefore, we have to do with the former only.

But before we deal with the föhn as we find it at Davos, we must learn something about the origin of this remarkable wind in general.

The preliminary conditions for the appearance of the south föhn exist when a centre of low pressure in the west or north-west, from the Atlantic Ocean hitherwards,

produces considerable movements of the air from a southerly direction over Central Europe. Air first of all streams from the alpine borderland, and out of the valleys on the northern side of the Alps, in the direction of the depression. There results on the north side a lower atmospheric pressure than in the south; in the plains the barometric gradient may be very high, as the mountains stand in the way of an adjustment. The air now ascends the southern ramparts of the Alps, and, after crossing the summits, descends with more or less violence into the valleys on the northern side. In ascending, the air gets to be under less, and in descending under greater pressure, and is therefore first of all expanded and then compressed. In connection with this process there is a dynamic cooling and warming, respectively, at the rate of 1^0 C. for every 100 m. of altitude. As a consequence of the cooling which the air undergoes during the ascent, a large part of the moisture present in it is condensed and falls on the southern side of the mountains in the form of rain or snow. During the process of condensation, however, a great deal of latent heat is set free, and this remains in the air and causes it to arrive at the summits considerably warmer than corresponds normally with such an altitude. As the relative humidity in the lower parts is greater in the winter than in the summer, the cooling in winter is also even less than in summer. When the air sinks again, the reverse of the process already described must take place, with evaporation of the products of condensation, together with the using up of a corresponding amount of heat. The condensed vapours have in the meantime fallen on the side of the mountains against which the wind is blowing, and the descent of the air is accompanied by the same dynamic increase of heat as in the case of dry

air, namely, at the rate of 1° C. per 100 metres. The difference in the upward and downward movement has the result that the air arrives below warmer and dryer than it was when it was ascending; warmer, because on ascending it became enriched with the warmth resulting from condensation; dryer, because this precipitation has fallen from it, and the vapour which it contained has been reduced by this amount, while the relative humidity is also perceptibly decreased by the increase which has taken place in temperature. Here, therefore, we have the physical explanation of the warmth and dryness of the föhn wind. Each of these distinguishing features, especially the latter, is so characteristic of this wind, that it is justifiable to call even a scarcely perceptible southerly air-current the föhn as soon as the relative humidity has fallen below 35%. For the föhn is not always a violent wind: it manifests itself in all degrees, from a tempest to the föhnlike, warm and dry air which sinks down on the centre of highest pressure.

The frequency and intensity of föhn weather are to a great extent dependent on the topographical situation of a place and the general form of the land. Whereas at Davos there are on the average 15 to 20 days in the year with more or less pronounced föhn, this number rises in many places in the lowland plains to 50—70; and while at Davos it is an exception for the föhn wind to exceed gradient 3 of Wild's Wind-scale, it rages through larger valleys, such as, especially, those of the Reuss, Linth, and Rhine, with terrific force. It whirls about everything not fixed and fast that stands in its way; it uproots trees, unroofs houses, and, when it surprises man and beast in the open, is capable of lifting them off their feet and carrying them away for some little distance. It has often been the cause of spreading

a destructive fire; for which reason there is in some places a law which provides that all fires shall be extinguished as soon as the föhn begins to blow.

It lies in the nature of the origin of this wind that it should blow less violently in the high-lying valleys than in the lowlands; for during föhn weather the barometrical gradient between the northern and the southern borderland of the Alps is greatest at the level of the plains, and decreases with increase of elevation, the Alps thus becoming less and less an obstacle to atmospheric adjustment. The intensity of the föhn is, however, proportional to the height of the barometer.

In the Davos Valley the föhn shows itself in a moderated form. A day of föhn weather often passes over without people in general being aware of it. The coming on of the föhn is first made evident to the attentive observer by the unusual transparency of the air: it is what is called föhn-clear. Distant mountains become overwhelmingly near; their masses tower up before us larger and vaster; the dark regiments of pine-trees put on a deep-blue gleam. Every tree, every rock, every runlet of water stands out with remarkable distinctness. The mountains are, especially by moonlight, a magnificent sight. Then a few strips of cloud appear one by one in the southward sky; soon a light south wind begins to blow, swelling up occasionally into gusts. The föhn wind has come.

During a föhn period, the length of which may vary from a few hours to several days, the normal movements of the temperature do not take place. A very quick rise may occur, especially in winter. On the other hand, the gusty nature of the wind may bring about considerable fluctuations. As long as the föhn holds on, the sky remains uniformly clouded, and is not subject to the

changes which are usual during the day. The red in the sky morning and evening is much more vivid than at other times; the moon has a halo or, more rarely, a ring round it.

When the föhn is of a fairly pronounced character, the daily fluctuation of the relative humidity is also wanting, and the amount of vapour in the air falls below 35%. In consequence of this dryness and warmth, the autumn föhn is also known as the "grape-cooker" and the spring föhn as the "snow-eater". The rapidity with which the snow disappears before its breath is indeed astonishing. One day of föhn will melt away as much snow as four days of sunshine. After a period of south föhn there is generally a fall of rain or snow. This is the case 75 times in every hundred. The barometrical minimum has travelled eastwards; the south or south-west wind has gradually changed to west or north-west, and this brings about a considerable cooling of the air on the northern side of the Alps, and is therefore followed by rainfall.

When it lasts and is severe, the föhn has an unfavourable physiological effect on the human system. It weakens digestion and makes one nervous and tired. It is not clear to what factors this is to be ascribed. Possibly it is partly due to the fact that the föhn considerably increases the dissipation of both electricities and lowers the radio-active emanation.

It must be repeated that the before-mentioned effect of the föhn wind on the system only appears in pronounced form in the real föhn channels of the lowlands. At Davos the föhn is comparatively seldom, and it is even then as a rule so modified in character that only very sensitive invalids are inconvenienced by it.

In conclusion let us briefly recapitulate the most important features of the Davos climate, as follows

Atmospheric Pressure:

Lower air pressure (thin air).

Temperature:

Low mean annual temperature. Powerful solar radiation of heat, and at night powerful terrestrial radiation; consequently, cold nights and warm days, cold winter and moderately warm summer; on the whole, low temperature all the year round.

Light:

Intenser light than in the lowlands. Great clearness of sky.

Electricity and Radio-Activity:

Greater power of the electric field, and higher radioactive emanation than in the lowlands.

Hydrometeors:

Small absolute amount of water-vapour in the air and, with sunshine, also low relative humidity; small rain and snowfall: fog rare.

Snow on ground 5 to 6 months: consequent purity of air in winter.

Wind:

Regular valley-wind, especially in summer;

General movements of the air very slightly felt.

THE FLORA OF THE DAVOS VALLEY

BY DR. K. MÜHLE

When in the lowlands the leaves are fading and the autumnal wind blows cold across the fields, then Davos begins to fill up. Every day brings its quota of invalids, who hope to be made well again by the wonder-working mountain air. Our valley has already donned its robes of snow, or is ready any day to do so. Not a flower is left to greet the wanderer by the wayside. Fields and meadows are covered with the faded yellow of dead vegetation. The larches shake down their last amber-coloured needles at our feet. Only the pine-woods retain the full glory of their changeless, evergreen dress, which bears indifferently the hot rays of the summer sun and the flakes of winter. And the first news of the awakening of Spring has hardly come up from the lowlands before a large proportion of the visitors make ready for their departure from Davos. The snow still lies deep to right and left of the railway-line along which the homesick ones are sped; white are the mountain slopes, white is the whole gleaming valley which receives their farewell gaze. Many, very many, have seen Davos only under snow, and can form no idea of the splendour in which the valley is adorned by the summer sun.

The climatic conditions of the Davos summer and its suitability for the cure of various complaints, are

fully dealt with in another section of this book. In this place we will only remark in passing that it was the very successful summer cures which laid the foundation of the fame of the health-resort, and at once take up our real theme, the Davos Flora.

Brehmer, the originator of the views which nowadays prevail concerning the treatment of phthisis, lays great stress on the importance which must be ascribed to the invalids' environment as a factor in the cure. The more beautiful, the more elevating, the more joyful everything is which influences the patient's mind, the brighter the impressions which he receives, so much the better are the prospects of a cure. Our visitors therefore do wrong to bid farewell to the Davos Valley just when it is on the point of clothing itself in its most beautiful raiment. The magnificent flora is surprisingly rich in variety, and enchanting in its wealth of form and colour. Nothing affords a greater pleasure than familiar intercourse with these favourite children of the sun, whether they have just emerged from their protective sheaths or, in all the glory of their full-bloomed beauty, are waving in the light, or whether, having finally fulfilled their mission, they stand at last waiting with bowed heads. Of course one must be somewhat fond of them and know them thoroughly in order to understand how joyfully they do battle with all the inclemencies of the altitude. But he who has the feeling for this modest bravery and gleaming beauty, will find a truly lofty pleasure in busying himself with this little world, or in merely feasting his eyes upon it.

At the beginning of March the first stirrings of awakening life take place on some of the southward facing slopes.

Somewhere thereabout stand a few fine old red firs

Davos nival flora II. (Natural size); l. = limestone, p. r. = primitive rock.
a) **Saxifraga bryoides** *L.* 3226 m. p. r. Piz Vadret. — *b)* **Hutschinsia alpina** *R. Br.* 2713 m. l. Schiahorn. — *c)* **Eritrichium nanum** *Schrad.* 3300 m. p. r. Piz Kesch. — *d)* **Androsace helvet.** *Gaud.* 2785 m. l. Thiejerfluh. — *e)* **Linaria alpina** *Mill.* 3047 m. p. r. Bocktenhorn. — *f)* **Silene excapa** *All.* 3131 m. p. r. Piz Grialetsch. — *g)* **Trisetum subspicat.** *Beauv.* 3131 m. Piz Grialetsch.

uarelle by F. R. Gygi, Davos. Jahrbuch S. A. C. XXXIII. Printed in 5 colours by the Davos Printing Co., Ltd.

with far-reaching branches, which all through the winter caught the falling snow on their branches, so that only a comparatively thin layer could cover the earth around their trunks. The February sun shone in with great power, and succeeded in melting the snow. Here, at the foot of the firs, the ground first comes to light. And hardly have the first vestiges of snow disappeared when the sun, the great conjurer, charms up a gaily-coloured carpet of the first flowerets to cover the spot, and the wanderer who climbs up over the hard snow in the early morning to such a place may stand fascinated before this oasis in the deep snow, and have the happiness to break off the first blooms that the year has offered to him: the lovely Erica carnea, the flesh-coloured heath, with its bright rose-red bells adorned with prominent black-brown, stamens, and the evergreen Polygala chamaebuxus with its tender yellowish flowers.

Somewhat about the same time the coltsfoot shows its bright yellow flowers on their scaly stalks, and by the side of a warm spring here and there in the midst of a meadow the Caltha palustris or marsh marigold blooms on an open green space. Again and again fresh snow covers up these first messages of the spring; heavy frosts work destruction upon them; but they have done their duty; the awakening call has sounded through the valley.

The first diaphonous bells of the crocus vernus come to light on the southern slopes, out of the trickling, icy water melting from the snow. Here and there peeps up the modest daisy (Bellis perennis), and towards the end of March the first furry anemones (Anemone vernalis) are to be found. This charming flower is still wrapped in its metallic-shining mantle, out of the folds of which it grows

forth, some weeks later, on its slim stem. It is first found in bloom on the Schatzalp, the Meierhofberg, and the Jakobshorn. As it keeps fresh for a very long time when packed in moss, people are fond of sending it home as a first characteristic spring greeting from the mountains.

At the end of March or the beginning of April, when the alder (Alnus nicana) begins to scatter its pollen, thick tufts of Petasites albus spring up on moist, sheltered spots; the unpretending little ears of some sedges (Carex montana) enliven the open parts of grassy places, and on the sunny meadows the wonderfully beautiful blue of the Gentiana verna beams up to us for the first time.

It is of course impossible to specify exact dates for the first and the various progressive stages of the spring. In many a year a prevalence of "föhn" weather for a fortnight will wipe the whole white burden from the earth by the end of March, and immediately all is in bloom, and gleams forth like one great colour-symphony. Another time it will snow and thaw alternately all through April and even on into May. According to Schibler's* observations, out of the 900 to 1000 plants which are to be found at Davos, 15 to 22 bloom regularly by the end of March; by the end of April 87 are added, and by the end of May another 75 varieties. In general, spring is at its full in the valley from the middle to the end of May; from which time all goes forward with tremendous rapidity, every morning bringing new flowers and every day new and more beautiful colours.

Of the 27 varieties of ranunculi which are to be found at Davos, there are in particular five different kinds of anemone which adorn the countryside quite early. The furry anemones, which are over by about the end of April, are

* W. Schibler, Jahrbuch des Schweizer. Alpenclub, 1896/97.

replaced, on clayey and quartz soil, by the beautiful sulphur anemone, which, in conjunction with the great corollas of the Gentiana acaulis, cover many of the slopes in a veritable mantle of yellow and blue. Seventeen varieties of gentian grow in the Davos Valley. Most of them are of a blue so deep and luminous that no other colour can by any means be compared with it. And then there is the charming group of the Primulacceæ, which have rightly been called the crown jewel in the flower-diadem of the mountains. The fifteen varieties to be met with here, from the delicately fringed soldanella alpina on the valley slopes, to the quickly-flowering Primula integrifolia and Androsace glacialis on the icy heights, unfold all the grace that the flower world has to offer: lovely form of the blooms, soft, velvety colours, fulness and size of the umbel in proportion to the always delicate, balsam-fragrant rosette of petals. It is impossible to describe the gleam of beauty with which these flowering masses of alpine primulas are capable of adorning the barest precipices.

By the end of June the flowering-time is already at its culmination. In the height of summer it is only at the greatest altitudes that the flowers are still perfectly fresh. In June, following immediately upon the snow-melting, the alpine flora breaks out into bloom, and those who have not seen this carpet of flowers in its virgin freshness, can form no idea of the splendour and ravishing beauty of the mountain world.

The sward of the valley-meadows is composed of from 30 to 40 graminaceæ and an equal number of papilionaceæ, including the Meum mutellina and Plantago alpina, which are especially valued for their flavour; and the Alchemilla vulgaris and Poa alpina, fodder of the very first rank. But the tall flowers, crowded closely together, practically cover

in the shorter green plants. The delicate rose of the Primula farinosa, the light yellow of the hawkweed, the dull copper-red of the Bartsia, the anemone's cold white, the noble blue of the gentians, and the deep velvety hue of the violet, compose the principal colours in this irridescent painting. Seven kinds of Epilobium and 16 different orchids open their blooms to the summer sun, the most particularly noteworthy among them being the black velvety, highly scented Nigritella. In shady places in the woods we find the tall larkspur (Delphinium elatum) and the splendid yellow gentian, spread out like a chandelier. The tender Parnassia palustris adorns in great masses the clearings of the fir-woods. The large-bloomed clematis (Atragene alpina) climbs about on the lakeside path; and in the same place, as well as in the Dischma, the lovely little bells of the Linnaea borealis bloom in large numbers. In the Monstein Valley we meet with the much-coveted Eryngium alpinum, a thistle-like umbel of knobby inflorescence with little steel-gleaming prickly sheathing leaves charmingly distributed all round it. And on the heights, (on the Strela Pass and in the Ducan Valley, for example), the woolly edelweiss (Leontopodium alpinum) is in flower, accompanied by its associate, the sun-loving aster alpinus.

Where, however, the meadow slopes are intersected by projections of rock, causing marshy depressions of the soil, we find, in addition to all sorts of sedges (Carex), Vaccinium uliginosum, Juncus, Empetrum, Azalea, and the snow-white balls of the cotton-grass (Eriophorum scheuchzeri). The slopes of rubble stretching between thicket and pasture are the haunt of a large number (16) of saxifrages and stellata. Here, too, is the home of the Aronicum scorpioïdes with its great, bright yellow rayed blooms, a

favourite food of the chamois; and by it gleam the charming ringent blooms of the Linaria alpina, which, with its palate of burning bright yellow and the deep violet flower, affords one of the most beautiful colour contrasts of the alpina flora.

In the spring, when the meadows shine forth in their fresh, ethereal green, white and rose-red are the prevailing colours: crocus, anemone, snow-ranunculi, Primula farninosa, silene, and the graceful soldanellas are the first to awaken. It is not until a few weeks later that the burning yellow and orange blooms of the leopard's bane, of the groundsel, of the arnica, the black of the orchis, the black of the leguminosæ, and the purple red of the rhododendron, join company. When at last the wedding raiment of the Alps has yielded its splendour to the haymaker's scythe, several weeks pass away during which the meadows lie dead and barren. Then the blushing rose-red creeps again over meadow and mountain-side, like a reappearance of springtide: the meadow-saffron (Colchicum autumnale) opens its tender cups in multitudes which do not fall short of the crocus-flowering of the spring. The borders of the woods, however, clothe themselves in the pretty dress which the ling or common heath (Calluna vulgaris) has woven for them.

After having sketched in broad outline the flora of the bottom of the valley, let us ascend to the dark band of the woods which runs all round it and lends the fitting solemnity to the brilliant picture.

The domain of the conifers reaches at Davos to a height of over 6500 feet. The principal tree in this region is the red-fir or pitch-pine (Pinus picea du roi, Abies excelsa poir). It gives a serious and occasionally gloomy character to the slopes of these mountains; but its deep

blue-black, in contrast with the bright green and the penetrating light of the higher Alps, is also that which gives the landscape the variety of vigorous colouring which constitutes the best part of its beauty.

The fir-tree reigns supreme in many parts of the Davos woods: like imposing pillars its trunks rise solemnly up in heroic proportions towards the heavens, and their crowns spread out high in the light. Next to the red-fir, the larches (Larix europæa) and the mountain-fir (Pinus uncinata, Koch, montana Mill.), and the fir-leaved, cembra, or Siberian fir (Pinus cembra) are the most important representatives of the conifers.

The larch is intermingled with the firs and pines, often in considerable numbers, and climbs up close to the very tree-limit. Its slender branches, thinly covered with needles, contribute not a little to the enlivening of the autumn landscape. Davos has to do without foliage trees and the glowing tints of autumn. The larch, however, affords some compensation, the colouring of its needles, which ranges from the lightest sulphur yellow to dark orange, making a splendid contrast with the green of the pine-trees.

The cembra-fir, like the larch, grows at the greatest altitudes. The one heavy and compact, the other light and graceful, they remain in their strangely contrasting natures faithful the one to the other. In the main valley the cembra is rare; we find it at Wolfgang and in the side-valleys (Flüela, Sertig). It does not grow straight up like a pillar, but undulated; the thick-set, heavy tufts of leaves crowded together at the end of the branch are of a deep brown-green; the crown is rounded off to an oval, and reminds one rather of heavy foliage trees than the pointedness of the conifers. Its seed (cedar nut) is edible. The

wood of the cembra-pine affords an oily-shining beautifully marked material for wainscotting. Its juniper-like smell contributes not a little to the alpine character of the dwellings in whose construction it is used.

The mountain-fir is a more subordinate member of the conifer woods. It is well distinguished from the common fir (Pinus silvestris), which is found at Davos in the "Züge", by its sharply tapering top and its dark-green needles. In its growth it exhibits all transitions from the tall-stemmed tree-form to that of a low many-branched bush with branches trailing on the ground. Near Wolfgang, growing on serpentine rock, we find one of the few continuous stocks of tall-stemmed mountain-firs to be found in Switzerland. It is nearly 100 acres in extent, sparingly mixed with larches and firs. In the undergrowth dominate vaccinia, lichens, mosses and globularia; and Leontodon pyrenaicus is very luxuriant. With this is associated the creeping fir (crook-wood), which climbs up very high on limestone and primitive rocks. It sometimes creeps along the ground, slips for some way underground, continues in fantastic windings over the rubble, to end at last in upright branches.

In the fir-woods by Wolfgang, on the Flüela, and scattered about elsewhere, there appears also the juniper-tree (Juniperus communis) and the dwarf juniper (Juniperus nana). This hardy, sturdy fellow is famous as the tree which grows higher than any other European species.

Among the conifers we find, indeed, here and there, a solitary birch (betula alba), a poplar (populus tremula, L.), mountain ash or rowan (Sorbus aucuparia), sorbus chamaemespilus and bird cherry (Prunus padus) or one of the numerous varieties of willow. Eleven kinds of salix are represented at Davos (by the Sertig Waterfall alone

there are seven close together). Near a great rock in the Schia-Tobel above Davos-Dorf stands the only beech-tree in the valley; but it does not trust itself to grow up out of the protection of the rock which shelters it.

Often, and on slaty subsoil up to more than 6500 feet, we come across the alpine alder (green alder, birch-alder, Alnus viridis). At the beginning of the alpine spring its male catkins burst open, and the pollen, blown away by the wind, is an early sign of spring. This shrub is popularly known as *dros* or *drüsh* — probably from the resinous covering of the young leaves, a secretion from "*drusen*" (glands), — and the Drusatscha-Alp, above the Lake, takes its name from this.

The undergrowth of the whole of the wood-belt is for the most part abundant and beautiful; for the woods are thin enough to let in the sunlight. The flesh-coloured heath and the white dryas (Dryas octopetala) cover considerable areas with their growth; the clearings are adorned in the spring with all kinds of primula and gentian. In moist spots bloom Aconitum napellus, Polemonium coeruleum, Geranium sylvaticum, Myosotis alpestris and Thalictrum aquilegifolium. Hypnum trails its long tendrils along the mould-rich earth; the crowberry (Empetrum nigrum), vaccinia, bear-berries (Arctostaphylos) are very plentifully represented. The bushes of the Rosa alpina L. (by the Sertig Waterfall and the Totalp torrent) form a wonderful adornment of the conifer region; there is nothing to compare with the simple beauty of these magnificient red blooms when, in July, they unfold themselves to the light out of their deep, green, luxuriant leafage.

In many places the alpine rose is found, sporadically, just above the bottom of the valley (on the lakeside path, the Landwasser road, by Wolfgang). Its shrubs accom-

pany the conifer woods up to their extreme limit, and then, beyond, they climb, in company with the alder, the juniper, the alpine azalea (Azalea procumbens), and the heaths, the vaccinia, the bear-grape, and the crowberry, to a height of nearly 7500 feet. They prefer, however, the tree-limit regions, up to an altitude of about 1000 feet above it, and form a second, evergreen belt of shrubs. Three kinds are found at Davos. By far the most numerous is the vigorous and tall, rust-coloured species (Rhododendron ferrugineum) with close bloom-umbels of dark purple; in lesser numbers, the hairy variety, R. hirsutum, with its pleasant green leaves and the luminous red of its delicate flowers, (which has a fondness for the limestone); and the bastard of the two (R. intermedium). In places where they cover large areas, the flowering alpine roses awaken by their rigid form and their dark colouring an impression of the desert and the deserted; but they have an effect of incomparable beauty when they gleam out upon one from the woods, clothing the feet of their high-towering companions with lovely flowers and everlasting green.

We leave behind us the dark border of the tree-limit and press upwards through rustling rhododendron bushes and over espaliers of azaleas towards the tops of the mountains. Fewer and fewer become the alpine roses; the dwarf bushy heather forsakes us; we are in the region of the primeval pastures, the last and highest stage of the Alps where the soil is capable of being put to some simple use. It is left entirely to itself, and is in parts visited only by sheep and goats. Here on the waste wilderness of rocks break the last gentle wavelets of life. Far-reaching slopes of rubble take the place of the contiguous meadows; perennial snow-patches alternate with bits of turf. The plants form a short sward, and bring forth for the most

part white flowers. They are hard, and have an aromatic smell, so that even the common ranunculi become fragrant. Finally, at an altitude of about 8500 feet, the nival region begins, where the summer sun is no longer able to wholly melt the snow. Extensive areas of eternal snow alternate with surfaces composed of veritable seas of stones upon stones, out of the bosom of which, masses of rock here and there climb up wild and high into the air. A stillness as of death lies over all; eternal chaos here seems to hold its solitary sway. But the creative spirit of life does not allow itself to be so easily scared away, and the observant eye discovers that here on the peaks which lift their heads high over the world into the great air-ocean, a unique plant-world of a most fascinating kind holds its own in spite of every difficulty and danger. With the rolling stone and with the waters that tumble down into the valleys these delicate pioneers wage a bold warfare; neither the grim cold nor the wild tempest has been able to drive them back to the more hospitable depths. We stand with admiration before these dwarfs of their race, whose bright blossoms look up, for the most part stalkless, from their little rosette of leaves to the sky above them.

In Davos* the snow-region is richly developed. Almost the whole of the principal ridge of the Albula chain, from the glaciered Weisshorn and Schwarzhorn, on the Flüela Pass, over the top of the Radün and Piz Grialetsch to the Kühalphorn, together with the depressions, is situated entirely within the nival region. So, too, are the

* I have adhered in the main to the data afforded by Schibler, the best authority on the Davos nival flora. W. Schibler, "Ueber die nivale Flora der Landschaft Davos", Jahrbuch S. A. C., 1897/98. Both the coloured plates reproduced in this book are also taken from the same source.

peaks of the Ducan chain; and the four lateral chains (Flüela, Dischma, Monstein, Sertig), which run out from these main ridges towards the Landwasser Valley, also reach at many points into this region. The Strela range, too, has a number of peaks over 8500 feet high.

In his wanderings through the Davos nival regions, Schibler has met with 209 different species of plants. Many of them, however, are hardly in a position to propagate themselves under the conditions that prevail in the snow-region. On the other hand, there are large numbers of flowers which only develop their full beauty in the neighbourhood of the glaciers, and of these true children of the snow-region the following species are found at Davos: Agrostis rupestris, Trisetum (Avena) subspicatum, Poa laxa, alpina, Sesleria disticha, Festuca Halleri, Carex curvula, Luzula spicata, Androsace glacialis, helvetica, Linaria alpina, Eritrichium nanum, Gentiana bavarica imbricata, Ranunculus glacialis, Draba tomentosa, frigida, Wahlenbergia, Cherleria sedoïdes, Cerastium latifolium, uniflorum, glaciale, Silene excapa, Arenaria ciliata multicaulis, Saxifraga oppositifolia, bayoides, Aizoon, exarta, stenopetala, Segnieri, Potentilla frigida, Geum reptans, Erigeron uniflorus, Artemisia spicata, Chrysanthemum alpinum, Aronicum scorpioïdes, Senecio carniolicus, Taraxacum officinale alpinum, Phyteuma pauciflorum, Campanula cenisia, Pedicularis rostrata.

These plants are all found in beautiful perfection and bloom at an elevation of more than 9600 feet. They all naturally prefer to grow on the south side, liking best of all the precipices, on which the snow can find no hold, or narrow strips of rock. We find accordingly, that the sunny ridge of Piz Vadret (10,611 feet), situated among the ice, affords shelter to 17 species, Piz Linard (10,827—11,155

feet) nine, Piz Grialetsch, on the northern side of whose peak (10,340) ice and eternal snow come close up, as many as 20 species. On the Kühalphorn (10,126 feet) 20 species are to be found, which may be enumerated as a typical nival flora: Poa laxa, Sesleria disticha, Festuca Halleri. Carex curvula, Luzula spicata, Erigeron uniflorus, Chrysanthemum alpinum, Senecio carniolicus, Phyteuma pauciflorum, Androsace glacialis, Gentiana bavarica f. imbricata, Ranunculus glacialis, Hutchinsia alpina, Cherleria sedoïdes, Cerastium uniflorus, filiforme, Silene excapa, Saxifraga oppositifolia, bryoides, exarata, Potentilla frigida. In addition to altitude, the nature of the ground is of the greatest importance in determining the richness and character of the flora. On the moist hornblende schist of the Bocktenhorn peak (10,000 feet), which is so easily disintegrated by the action of the atmosphere, as many as 27 species grow; but on the dry limestone of the Aelplihorn peak (9875 feet) there are only nine. More striking still is a comparison of the state of things on the lower limestone mountains on the right side of the valley: the Kupfenfluh (8711 feet) has 66, the Amselfluh (2780 feet) only 10 species.

The influence of the rock foundation is very evident on the Schiahorn. The peak of this mountain bears on its southern declivity, at an altitude of over 7546 feet among the limestone mountains, 48 species. In the direction of the Schafläger, micaceous schist joins on in a sharp line to the limestone. Out of this mica-slate grows at the same elevation, and compressed into an area of a few square metres, a flora of 65 species. Thanks to this junction of different rocks, we find on the Schiahorn an extremely rich flora of 91 species.

The fissured stone masses of the Totalp-Schwarzhorn contain, at an altitude of 8790 feet, 13 species, which may be

enumerated as an example of a serpentine flora: Lycopodium selago, Poa laxa, Primula hirsuta, Linaria alpina, Cardamine resedifolia, Hutchinsia alpina, Alsine verna, Cherleria sedoïdes, Cerastium latifolium, Saxifraga stellaris, varians, androsacea.

In comparison with the flora of our meadows, the wealth of the nival flora is in various places remarkable. The reason is that the sward, under the conditions of growth which prevail on the lower-lying meadows, forms closed areas, in which those plants which specially thrive on manure spread quickly, and hinder the coming up of the others. The regular meadow processes, especially all contact with cultivation, are fatal to many species. High up on the mountains there is still room for development, there is only the fight with the elements to be waged, and this all the nival species are capable of sustaining.

Heer has pointed out, in his work on the Rhaetian alpine flora, that half the species of the nival flora are also indigenous in the circumpolar regions.

Our two plates only approximately reproduce the beautiful colouring of the nival flowers. In reality, the soft sky-blue of the gentiana imbricata, the red stars of the silene excapa and the starry cushion of the eritrichium nanum, awaken, amid the forsaken and rugged wildness of their haunts, a thrilling impression. The large yellow flowers of the geum reptans and aronicum seem like greetings from a flower garden of the south. Only the whitish opalescent ranunculus glacialis puts one in mind of the nearness of the eternal snows.

But it is not only the beautiful colouring of their flowers that we have to admire in these children of the heights; how they arm themselves for defence against drought with a silver-shining covering of hairs or a thin

layer of calcium carbonate, which they produce from the openings of their leaves; how they bury themselves deep in the soil and cling close, in the form of a compact rosette, to mother-earth, as if they would enter into an alliance with her against storm and flood; how amid the death-dealing ice they so boldly and undauntedly preach of life and the creative power of the sun, — all this deeply touches the wanderer who in his heart really understands the struggles of these lovely creatures. If they cannot altogether wipe out the impression of inhospitality and desolation which extends everywhere over the rough sea of rocks and the icy fields of the high mountains, they at least have the redeeming effect of pealing bells, sounding from the abodes of mankind into the forsaken deserts; full of promise, like gaily coloured butterflies that in the midst of winter flutter before us in the sunshine; and propitiating, like smiling stars in the dark night sky, proclaiming that light and life are not yet extinguished.

THE PHYSIOLOGY OF THE DAVOS CLIMATE

BY DR. van VOORNVELD.

In speaking here of the high mountains, we shall confine ourselves to such elevations as at this latitude deserve attention from a therapeutical point of view on account of their climate, more particularly the altitude of Davos. We shall also deal exclusively with the normal, quiet life of man on the high mountains, and omit all considerations relating to fatiguing toil, mountaineering, etc.

It is true that during the past few years a good many investigations have been made concerning metabolism and the composition of the blood at high altitudes, but many of these investigations have been made at very great heights (from 3000 to 5000 metres, for example), at elevations, that is, which at this latitude are of no climato-therapeutical importance. Moreover, on these mountain expeditions it has generally happened that both those who made the scientific observations and those who were the subjects of them had just passed through a time of very great exertion. Owing to their exhausted state and the usually very much altered conditions of life and nourishment, the metabolism in such persons is not to be compared with that of the normal man in the lowlands, or even at Davos.

Many balloonists have also made physiological observations in the high regions of the atmosphere during their ascents; but it is evident that such observations cannot un-

reservedly be compared with those made under the physiological conditions which prevail among healthy and invalid persons at Davos.

On the other hand, many experiments have been made in the lowlands with artificially lowered air-pressure in pneumatic chambers, under the influence of the idea that reduction of the atmospheric pressure must be the main factor of the climate of high altitudes. The results of these experiments in pneumatic chambers were often, however, quite different from those which had been observed on the mountains. And it is evident that this must be so.

For, to put it briefly, the mountain climate in its influence on man is not to be considered as a gigantic pneumatic chamber with reduced atmospheric pressure. The influence of the mountain climate on the human system is extraordinarily complicated and many-sided. Even though the lower atmospheric pressure is one of the most important climatological features, especially for the changes which take place in the composition of the blood, it is not by any means the only one. There are very many influences, working more or less together, which have to be considered in connection with the climate of high altitudes.

The rarefaction of the air, the purity of the air, the intensity and long duration of the sunshine, the abundance of violet rays and of Becquerel rays*, the high electric potential, the small amount of cloud and fog, the dryness and

* Dr. Saake has recently discovered that on the high mountains the air contains on the average three times as much radio-active emanation as the air of the lowlands, and that the maximum content can be even five times that of the plains.

Seeing, however, that the electric potential, i. e., the tension-difference between the positive air and the negative earth, increases with the elevation above sea level, it is evident that, other conditions being equal, all objects on the mountains must be permanently in a higher

Frauenkirch in Winter

Frauenkirch in Summer

Avalanche in the "Züge"

coldness of the air, the calmness of the air, especially prevalent in winter — all these, together with some further factors, make up the climate of high altitudes, and bring about by their numerous and powerful stimuli the particular modification of the metabolism and of the composition of the blood which in so many cases we turn therapeutically to our advantages.

To those who have had personal experience at Davos of the many calm days, when the sun shines with such great force from the cloudless sky, and sends its vivifying rays through the thin, pure air, it will be quite evident that here on the high mountains it is not alone the rarefaction of the air which exercises such a powerful influence on the human organism. For, quite apart from the inestimable physical influence of the sun on man, the purely psychical effect of the sunshine on well and ill cannot be too highly estimated. "Dove non entra il sole, entra il medico", says an Italian proverb. The pleasant, sunny, fresh and cold weather that prevails so much more on the high mountains than in the lowlands, and which not only enables people to spend the greater part of the day in the open air, but also to thoroughly enjoy doing so, has such a powerful influence on mind and body, so stimulates the appetite and metabolism, that this one factor alone occupies an important place among the curative properties of the high mountains.

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negative tension than those on the plains. The accumulation of the radio-active substance on the surface of the human body, as elsewhere, will be furthered in a twofold manner: firstly by the ascertained greater quantity of radio-active substance in the mountain air, and secondly by the higher potential in the midst of which a man finds himself placed on the high mountains.

Cf. "Ein bislang unbekannter Faktor des Höhenklimas", Münch. med. Wochenschrift, January 5th., 1904, p. 22.

But, as we have already remarked, we must not separate too much from one another the various factors of the mountain climate in respect to their effect on the human system, and we will, therefore, proceed to sketch as a whole the main influences of the mountain climate upon the human system.

We must observe by way of preface that the influence of the mountain climate on the human organism 1) immediately after arrival and 2) after complete acclimatisation, is different, or at least different in intensity.

By acclimatisation is meant the time during which the human system is able to adopt itself to its modified climatological conditions. This period is longer for some persons than for others. On the average it is from two to three weeks, but may last several weeks longer. With some people it passes off almost unnoticed, but with others, especially in the cases of sensitive, anæmic or neurasthenic persons, it is more or less accompanied by disturbances of the general health, — disturbances, however, which with patience and a quiet life are soon overcome. Generally speaking, sick and sound respond in the same way to the influences of the climate, and there is only a quantitative variation in the re-action; but then again there are highly marked individual fluctuations.

Sleep is often better on the mountains than in the lowlands; but there are very many exceptions to this rule. During the period of acclimatisation many persons complain of sleeplessness; or a specific diminution of the need of sleep may arise, so that the person so affected may sleep but little, and yet in spite of this wake up the next morning with the feeling that he has had a good night's rest.

The appetite is for the most part improved, and this generally leads to an increase of weight.

The Davos climate influences the *digestion* in so far that a tendency to constipation often appears. At the beginning there is often an increase in the daily amount of *urine*.

In repose the *temperature* of the body is the same as in the lowlands. But in this connection also, as in the case of the pulse and respiration, and again chiefly during acclimatisation, one sees that with a little excitement or a small amount of exertion the temperature rises proportionately higher than in the lowlands; so that, therefore, a kind of intensified sensitiveness of the temperature-centre is produced.

F. A. Forel* observed that, as soon as he rested after exertion causing increase of temperature, his temperature became normal more quickly on the mountains than in the lowlands.

At the commencement of a residence on the high mountains many people experience a slight increase in the frequency of the pulse; but this gradually subsides. Still, in the case of a very sensitive person this accelerated pulse-rate may last several months, or may indeed persist the whole time. Then it is further to be observed that an erethism of the pulse often exists on the high mountains (again chiefly during acclimatisation), so that after a little exertion it shows a greater relative frequency than is the case under the same circumstances in the lowlands.

Whether in conjunction with this an increase or diminution of blood-pressure on the high mountains is to be assumed, has not up till now been determined with ab-

* F. A. Forel, "Expérience sur la température du corps humain dans l'acte de l'ascension sur les montagnes".

solute certainty. At the present stage of the investigation it seems most likely that during rest there is a small diminution in the blood pressure, for a little time at least after arrival.

The *rate of breathing* increases upon first coming up into the mountains: here, too, only a little during rest, but a good deal during exercise. Later on the respiration becomes normal.

The *vital capacity* (the volume of air breathed out by the most complete expiration following the greatest possible inspiration) is lessened in cases where residence on the mountains is not of long duration. This, however, is more than compensated by the increased rate of breathing, so that generally speaking there is on the average a slight increase in the quantity of air respired on the mountains.

Particularly in the case of persons who were, even in the lowlands, subject more or less to heart and respiratory troubles, but also even in the case of perfectly healthy people, *palpitation of the heart and shortness of breath* may occur, especially after too much exercise. As Veraguth pointed out, these troubles now and then make their appearance at night-time in the case of healthy persons, and assume an asthmatic character. Generally it means that the person thus afflicted has taken too much exercise before becoming properly acclimatised. Except when there is non-compensated heart-disease, it is only necessary in such cases to take things easy in order to get rid of these troubles.

With regard to *exchange of gases*, here again a noticeable difference is brought about by exercise. In places of moderate altitude (up to about 10,000 feet) the exchange of gases is not at all or only very little different from what

it is in the lowlands. With even moderate exercise, however, a fairly large difference sets in.

One *inspires more oxygen* than on the plains (increases of 8.8 %, 12.4 % and 21.5 % have been found by Jacquet, J. Loewy and L. Zuntz); but one also breathes out, on the mountains, more carbonic acid (Mermod 7 %, Jacquet 14.8%, Veraguth 35% more). — The *respiratory coefficient*

$$\left(\frac{\text{Quantity expired carbonic acid in ccm. per minute}}{\text{Quantity inspired oxygen in ccm. per minute}}\right)$$

is increased at high altitudes. Jaquet even found that this increase continues for some time after leaving the mountains. After a stay of eight days on the Chasseral (1600 metres) the increase in the respiratory coefficient was maintained in the lowlands for four months.

This observation probably throws light on the fact, ascertained by Alex. von Humboldt, that the inhabitants of very high places on the Andes have a strikingly expanded thorax.

Another very important fact, especially from a therapeutical point of view, is that on the high mountains *the human body retains nitrogen*, so that a kind of storage or saving-up of this important element takes place. According to Jacquet about 1.5—2 g. of nitrogen is stored up per day.

The combustion of *non-nitrogenous* substances, and especially of carbo-hydrates, is greater on the mountains.

Putting all the foregoing facts together, we may say that on the high mountains a considerable enhancement of metabolism takes place.

But a man also works more economically on the mountains than in the lowlands, after he has been somewhat in training here.

According to F. Hüppe,[1]) "the average healthy man is able on the mountains to convert 20 to 30 % of the total amount of his energy into mechanical performance, whereas the townsman who is exercised only in his ordinary labours is in the main capable of turning into mechanical work 15 % of the energy he derives from his food — with much production of heat".

The influence of the high mountain climate on the composition of the blood is very great, and at the same time extremely complicated.

A very considerable *increase in the number of red corpuscles* takes place on the high mountains, and with this is associated an *increase in the hæmoglobin*. This fact may be taken as quite proved by the most recent experiments. It has been maintained that the increase of the red corpuscles is not real, but only apparent, the appearance being caused by the increased volume of the hæmatocytometer on the mountains. Many investigations conducted by various experimenters have, however, shown that this view is incorrect, and a short time ago Professor Bürker[2]) proved that the height of the hæmacytometer was not greater at Davos than in the lowlands. It is not yet certain how this "blood-curve" is to be explained, and this still forms one of the most interesting of recent scientific controversies.

The increase of the red corpuscles and of the hæmoglobin is real, and not merely apparent; for the absolute amount of hæmoglobin per kilo in animals on the mountains is considerably greater than in the lowlands, and the total quantity of blood is also greater in mountain animals than is the case with animals in the lowlands.

[1]) "Ueber Kraft und Stoffwechsel im Hochgebirge", Pflügers Archiv, 1903, Vol. 95. [2]) Pflügers Archiv, 1904, Vol. 105.

Suter and Jacquet had a number of rabbits kept at Davos (1560 metres) under the same conditions as a corresponding number at Basle (226 metres).

After the animals had been killed, the Davos rabbits showed an absolute increase of the entire quantity of the blood amounting to 14.8%, and an absolute increase of the hæmoglobin amounting to 23%. The Basle rabbits had 5.39 g. of hæmoglobin per kilo of the animal, and the Davos rabbits 6.59.

Abderhalden has calculated for St. Moritz and Basle the quantity of hæmoglobin per 1000 g. of the weight of the animals experimented on, comparing those of the same litter. These tables show:

At St. Moritz, with 48 rabbits, an average of 10.18 g. hæmoglobin per 1000 g. of body weight,
At St. Moritz, with 45 rats, an average of 10.7 g. hæmoglobin per 1000 g. body weight,
At Basle, with 58 rabbits, an average of 8.53 g. hæmoglobin per 1000 g. body weight,
At Basle, with 64 rats, an average of 9.38 g. hæmoglobin per 1000 g. body weight.

This means, therefore, that at St. Moritz the rabbits had 1.65 g. more hæmoglobin per 1000 g. body weight, than at Basle (i. e. an increase of 19.3%), and the St. Moritz rats 1.32 g. more (i. e., 14% increase) than those in the plains.

Professor Bürker found in the case of rabbits brought from Tübingen to Davos (Schatzalp) that the hæmoglobin increased from 11.4 to 14% in three weeks. On this basis he calculates the absolute increase in hæmoglobin in the case of a rabbit weighing 2000 g. to be 2.6 g., i. e., an increase of 22.8 %; which therefore corresponds exactly with the results arrived at by Prof. Jaquet.

We take the following from Dr. Bürker's book:

In August, 1883, A. Müntz took some rabbits from the lowlands up to the summit of the Pic du Midi (2877 metres above sea-level, mean pressure 540 mm. Hg.), and examined the blood of their offspring in August, 1890. He found the following results

	Spec. gravity of the blood	Solid elements pro 100 g	Metallic iron per 100 g blood	Oxygen absorbed by 100 ccm blood
Rabbits from the Pic (averages)	1060.1	21.88	70.2	17.28
Rabbits from the Lowlands (averages)	1046.2	15.75	40.3	9.56

But also in the case of sheep which had not undergone years of acclimatising, but had been on the slopes of the Pic du Midi, at a height of 230 to 2700 metres, for only six weeks, similar considerable changes in the blood were shown.

	Spec. gravity of the blood	Solid elements pro 100 g	Metallic iron per 100 g blood	Oxygen absorbed by 100 ccm blood
Sheep from the Pic (averages)	1053.2	18.9	60.4	17.47
Sheep from the Lowlands (averages)	1038.0	13.58	32.5	7.32

Loewy also found, in the case of animals which were bled to death on the mountains, a considerable increase in the entire quantity of hæmoglobin and the entire quantity of blood, as compared with animals of the same breed examined in the same way on the plains. Loewy also found that the marrow in the bones of mountain animals was richer in blood than was the case with animals in the lowlands.

This hyperæmia of the marrow, which is known to be the principal seat of the formation of blood in men, is the anatomical expression of the increased formation of blood which takes place on the mountains.

Very interesting is the fact which has recently been established by Bürker, that directly after arrival at Davos the amount of iron contained in the blood and in the liver begins to increase; after a few days it sinks a little, in blood and in liver; then, about a fortnight after arrival in Davos, the amount of iron in the blood goes on increasing, while that in the liver decreases to such an extent that it becomes less than in the lowlands. The iron in in the blood is a manifestation of the hæmoglobin it contains, for the iron is found only in the hæmoglobin. Now, the increase of iron in the blood at Davos is about twice as great as the increase of iron in the liver: the blood must therefore draw its supplies from other sources than the liver, probably from the marrow, or the iron must be supplied by increased reabsorption from the intestines.

Some investigators have found *nucleated red corpuscles* in human blood on the mountains. Under normal conditions this is only seen, so far as man is concerned, in the embryonic state. It may be symptomatic of a very unusual increase in the formation of blood. However, as this observation has not yet been sufficiently confirmed in other quarters, we must not at present lay much stress upon it. I have personally not yet succeeded in ascertaining the existence of nucleated red corpuscles in human blood at Davos.

Of the many researches which have been published concerning the increase of the red corpuscles, we will only quote, as examples, the results which have been arrived at by Kündig[1]) and myself[2]) at Davos, and already published.

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[1]) Correspondenzblatt für Schweiz. Aerzte.

[2]) Archiv für die ges. Physiologie, 1902, Vol. 92.

Kündig found the following average number of red blood-corpuscles per cubic millimetre:

In 14 healthy men	6,551,100
„ 10 „ women	5,804,000
„ 12 tuberculous men (slightly ill)	6,564,000
„ 10 „ women „ „	5,774,000
„ 7 „ men (moderately ill)	6,649,700
„ 5 „ women „ „	5,670,000
„ 10 „ men (severely ill)	6,978,400
„ 2 „ women „ „	5,736,000

My own examinations gave the following results:
Average number of red corpuscles per cubic millimetre:

In 26 men, well and ill together	6,212,000
„ 9 of these men, healthy or not tuberculous	6,290,000
„ 9 „ „ „ with "open" tuberculous	6,317,000
„ 8 „ „ „ „ "closed" „	6,005,000
„ 30 women, well and ill together	5,699,000
„ 8 of these women, healthy or not tuberculous	5,595,000
„ 6 „ „ „ with "open" tuberculosis	5,954,000
„ 16 „ „ „ „ "closed"	5,657,000

When it is borne in mind that in the lowlands men have been found to have about 5 million and women about 4 1/2 million red blood-corpuscles per cubic millimetre, the above quoted observations show what important changes take place in the blood of persons who come to stay on the high mountains.

Not many investigations of the *white corpuscles*, the number of which is known to fluctuate in peripherical blood, have been made on the mountains. From what we at present know we must infer that on the mountains the number of white corpuscles neither increases nor decreases.

According to Bürker, blood *coagulates* rather more quickly on the mountains.

Too few investigations of the *specific gravity of the blood* and of the *increase in the solid elements* of the *serum* on the mountains have yet been made, or opinions are still too inconsistent, for us to record results in this place.

Putting all the foregoing together, we may say that on the mountains metabolism is a good deal enhanced, and that a considerable increase takes place in the most important constituents of the blood.

On the mountains the human body is much more thoroughly flushed with blood than is the case in the lowlands, and the blood, on account of the increase or new growth of its most important constituents, as well as by virtue of the products of the enhanced metabolism, is able to promote the functional power of the various organs, and therefore the vitality of the whole body. The mountain climate stimulates the metabolism; it is, in fact, a stimulating climate, a tonic in optima forma.

What significance this has, or may have, for the invalid will be dealt with in another part of this book. Here we will only say that the enhanced metabolism and the increase of blood which take place on the mountains, in summer as well is in winter, are of value not only in tuberculosis, but really in all other morbid conditions for the treatment of which an invigoration of the whole system is necessary: in anæmia, convalescence after various illnesses, undernourishment, etc., and specially also in many neurotic complaints, in which, according to the view of many authorities, a primary disturbance of nutrition plays ætiologically an important rôle.

INDICATIONS AND CONTRA-INDICATIONS FOR THE HIGH MOUNTAINS.

BY DR. HANS PHILIPPI.

To many it may seem superfluous to enter upon this theme, seeing that so much has already been written concerning it. If I nevertheless venture to claim space for the following considerations, it is only for the reason that we mountain doctors ever and again discover that many lowland doctors are not at all clear as to what cases are suited for a cure in the high mountains, and what cases are not. If one looks through the literature of the subject one finds, even down till quite recent times, the most contradictory views expressed with respect to these indications. I therefore feel justified, on the basis of some years of careful clinical observation, in offering a contribution towards the clearing up of this question. I can only give here the bare results of my two years' study, having reserved a more thorough working out of the same for another publication. I must also refrain on the present occasion from entering the lists against the opponents of the alpine treatment, who have of late been much in evidence. We start, therefore, with the hypothesis that in many morbid conditions the mountain climate possesses great therapeutic value, as will also be shown by what follows. The distinctive features of the climate are dealt with elsewhere, and may in this connection be passed over.

References to literature will be extremely limited. Only in connection with very controversial points, or matters which have been but little worked up, or in which experience fails me, have a few authors been quoted.

The complaint for which the alpine climate has been most of all resorted to, is *pulmonary tuberculosis*. It is, therefore, in the nature of the case if I deal more fully with this part of my subject. Let us in the first place enquire what are the general circumstances in connection with this disease which are of importance to us in formulating indications.

With regard to *age*, there are some who advise that patients over sixty years old should not be sent to the mountains. I have myself seen comparatively good results in 4 patients ranging in age from 58 to 62 years. Two, indeed, of these patients had far less favourable results from repeated "cures" at southern health-resorts than they experienced here; so that they repeated their mountain cure, in one case once, in the other case twice, each time with good results. A lady 59 years of age, who arrived with high fever and extremely reduced by insufficient nutrition, made, in fact, a particularly good cure; for not only did the fever disappear and the lung affection become considerably improved, but within nine months she also increased over 40 pounds in weight. I am also under the impression that in children, except in early infancy, pulmonary tuberculosis takes a mild form on the mountains.

Sex does not concern us in dealing with this question.

With respect to constitutional factors I will only mention the much talked of *erethism*. Authors who have dealt with this symtom-complex are down to the present time of various opinions. For my own part I think it would be best to drop the designation altogether. — Here

I will give only the two principal definitions. By erethism is generally understood a condition of nervous irritability which manifests itself in a pathological tendency to increase of temperature and acceleration of pulse, as well as by disorders of a nervous nature. Penzoldt sees in it the manifestation of a tendency on the part of the lung complaint to gain ground. In the majority of cases the two definitions will coincide. Now, that erethism constitutes a contra-indication for the mountain climate, as has been asserted, I, in agreement with others, cannot allow to hold good in so general a fashion. It is, I think, precisely to the modern rest treatment that we must attribute the fact, observed by myself and other mountain doctors, that patients of this class lose at a high altitude not only their nervous irritability, but also their sensitiveness with regard to increase of temperature and acceleration of pulse.

In some patients whose lung affections had a progressive character at home, I have seen it become stationary, and a retrogression of the tuberculosis set in, on the mountains. Due attention being paid to all the factors to be mentioned hereafter, there will be no great risk in such cases trying the mountain climate.

Foremost among the indications it is the custom, rightly enough, to place *prophylaxis*. In all cases of this kind I have found at the end of the treatment a considerable improvement of the general state of health, and especially of the circulatory and respiratory systems. Thus, for example, a youth of 17 with pigeon-breast and a suspicious condition of the apices, gained a litre of vital lung capacity. Many doctors, however, hesitate to send such prophylactic patients to health-resorts frequented chiefly by lung patients, on account of the alleged danger of infection. Now this danger of infection is undoubtedly to be met

with everywhere, and it is, in particular, greater in what Dr. Turban so aptly calls "shy health-resorts" ("verschämten Kurorten") than at mountain health-resorts in which all arrangements are made in accordance with the modern principles of hygiene, to say nothing of the protective factors of the climate itself, which are also preventive of infection. As a matter of fact, cases of direct infection are very rare indeed, and take place only under particularly unfavourable conditions. The infection of a prophylactic at the mountain resorts has to my knowledge never been observed. The circumstance, for example, that at Davos, frequented as it is by thousands of lung patients, the mortality from tuberculosis among the native population has during the last few decades even somewhat decreased, is in itself a refutation of this insinuated greater risk of infection.

Very divergent are the views set forth in the literature of the subject relative to *manifest tuberculosis of the lungs*. I am thoroughly of Penzoldt's opinion, who requires, in cases where there is the slightest doubt with respect to indication for the mountain climate, that in addition to thorough examination of the seat of the disease, the patient should be seen at least every fortnight, and the conditions of pulse and temperature specially observed. So much is certain, that the more recent and the slighter the lung affection, the more certain and more complete the success to be looked for from the mountain cure. Accordingly, the first and second stages of pulmonary tuberculosis present in themselves no contra-indication *(Turban)*. Such contra-indication can only arise from the presence of complications of some kind, and the slighter the complaint, of so much the less consequence the complication. It is the third stage which presents the greatest

difficulties in respect to the formulation of indications. A number of authors uphold the opinion that those cases are contra-indicated in which the disease of the lungs has so far progressed that the still functional lung tissue is no longer equal to the greater demands made by the high mountain climate. We must, however, acknowledge that with respect to diseased lungs we have no reliable means of ascertaining what they are still capable of performing, seeing that, on the one hand, we do not know how much of the inspired air is turned to account in the diseased areas for the benefit of the system, and, on the other hand, our methods of examination do not allow us to identify deeper-lying changes.

Factors which enable us to draw up our indications with greater precision are the condition of the pulse and especially its rate. It is well known that this latter increases with the extension of the tubercular process in the lungs. Nevertheless, there is in this connection no direct dependence of the one on the other; for many other factors, such as fever, nervousness, anæmia, state of the heart-muscle, as well as other complications, have their influence on the pulse. Dealing altogether with 351 cases, I find that *all (24) cases in the third stage, whether with or without fever, which during complete rest showed a permanent pulse-rate of 120 or more per minute (group III.), ended fatally, either during the cure or shortly after returning home.* In point of quality, moreover, all had a poor pulse. In all these cases there was widely extended disease of the lungs, and in most of them grave complications in addition. For all these cases the high mountain treatment was to say the least purposeless. With high fever there still remains a small chance of the pulse improving when the fever ceases. In the first and second stages I have

Sertig-Dörfli

Saw-mill near Frauenkirch

On the Road to Frauenkirch

never found this quickening of the pulse. Tachycardia, brought about perhaps by change of climate, generally subsides after a short time, and hardly reaches such a degree.

Acceleration of the pulse between 100 and 120 (Group II.) occurred also in the *first and second stages*, but, with the exception of a case of myocarditis, was of a purely nervous nature, and disappeared with bodily and mental repose, and when the attention was diverted. Of the 56 cases of the third stage with pulse II., 21 (=37.5%) had a negative result. With respect to our question of indications, there are in connection with this pulse-group various other circumstances to bear in mind, such as extent of the lung affection, complications, fever, dyspnœa, etc.

The first and second stages, with a pulse-rate of less than 100 (Group I.), are above all indicated for an altitude cure. But also third stage cases with a similar pulse rate can, as a general rule, be sent without hesitation to the mountains, especially if the quality of the pulse affords the required guarantee. Of my third stage patients of this kind I have seen good results in 81 out of 92 cases (=88%). Complications are also of less consequence in this group if they are not in themselves of a serious nature. Similarly, fever is here of less importance. Of 40 patients of this kind who had fever on admission, 25 (=62.5%) lost their fever. In 3 only out of the 52 cases which were entirely without fever and belonged to pulse-group I., had the tuberculosis attacked 3 lobes of the lungs; but in spite of this the heart remained resistent, and the result was very satisfactory.

Of greater importance for our subject is *fever*. I regard it as absolutely necessary to deal with this symptom-complex strictly in association with the stage of the tuber-

culosis of the lungs, and with due consideration of the state of the pulse and complications of any kind. It is obvious that when the pulse is good, even high fever in the first stage affords better prospects of cure than month-long temperature, even with a weak heart, in the third stage. In this connection the duration of the fever is alone of importance. The longer the high temperatures have prevailed, so much the less are the chances of getting rid of the fever, a fact to which Turban has called attention, giving statistics. Even in cases with chronic fever, one now and again experiences pleasant surprises. Equally important is the source of the fever. High temperatures resulting from intestinal or renal tuberculosis are much more difficult to combat than simple pulmonary fever. The source must often be determined by experiment.

In what follows, cases with temperature rising from 37.4 to 38.4 ° C. are, in accordance with Turban's scheme, marked with an f, and those rising above 38.5 ° C. with F. The following considerations are based on observation of 329 cases. Of these cases 47 % were in the third stage, whereas Schröder, of Schomberg, for example, had in 1903 but 9.5 % of cases in the third stage. Only patients whose treatment lasted at least 30 days were taken into account.

Beginning with the *first stage*, we find the results most satisfactory. All the 19 cases with simple pulmonary fever — f throughout — got rid of their fever and attained positive results. Two patients did not lose their fever — one was a case in which the fever originated from a very chronic, relapsing pleurisy, and the other a case of pronounced hypochondria, in which the rise of temperature was certainly of nervous origin. If we deduct these two cases,

out of 21 patients with fever we have 19 who recovered normal temperatures, i. e., 90.5%.

In the second stage the percentage of cases in which the fever disappeared was naturally less (22 out of 29, = 75.9%), but still considerable. The non-disappearance of the fever was twice attributable to the progressive course of the tuberculosis in the lungs, twice to a fresh attack of bronchitis, twice to severe nervous disturbance, and once to a relapse in consequence of insubordinate behaviour. The frequency of the pulse was never more than 120, and never came into consideration so far as our enquiry is concerned. In this stage the character and height of the fever do not yield any factors for the formulation of our indications. It may, however, be well to point out in this connection that it is better not to send cases with F on a long journey: if it is at all possible, one should at least wait until the temperature has not risen above f for some time, and this without use of an antipyretic. Slight fever is therefore a priori no contra-indication for cases of tuberculosis of the lungs. Such contra-indication only arises when severe complications have supervened, as here in a case of myocarditis atheromatosa.

The question of fever is considerably more complicated when we come to the third stage. Out of 163 cases of this kind, 99 (=60.7%) were feverish on admission. Of this latter number, 43 (= 43.4 %) lost their fever — still a favourable result when it is borne in mind that of the total number of admittedly slighter cases treated at Hohenhonnef (according to Schröder), the fever disappeared altogether in 35.7 % only. With the exception of two complicated with malaria, all were cases of simple tubercular fever. We find, therefore, that in this class also the prospect of apyrexia and of general success of the cure

is very different, according to the extent of the lung affection, the condition of the heart, and the presence and severity of complications. The nature of the lung complaint — especially presence or absence of cavities — is in these advanced stages to a large extent irrelevant so far as indications are concerned. I personally have found that patients who had three and more lobes diseased (severer form of the 3rd. stage) did not do nearly so well, also in respect to fever, as cases with less extended tuberculosis (lighter form of the 3rd. stage).

I have tried to make the influence of the condition of the pulse and of the most important complications as clear as possible in the form of tables (I., II., and A). The percentages given are only of value for comparison. The functional power of the heart is expressed by the pulse rate, disregarding the few cases (3) of weakness of the heart with bradycardia. It is, however, noteworthy that in the group comprising the lighter form of the 3rd. stage (Table I), there are no cases with pulse III. (frequency of 120 and more). Improvement was only admitted to have taken place when the general health as well as the local conditions had distinctly improved. When for any reason the process in the lungs was in a worse condition at the end of the cure than at its commencement, the case was not counted as improved, even although the general condition was better, and previously existent fever had disappeared. From the section containing the more severe 3rd. stage cases (table II) I have, on account of the prognosis, taken out a group of cases in which more than three lobes were diseased, and in which, therefore, only half a lobe remained unaffected (Table A). As will be seen from this table, such cases may be regarded as absolutely contra-indicated. Contrary to the fact established

by the other tables, that the frequency of tubercular complications is in direct proportion to the extent of tubercular disease in the lungs, in this small sub-division of 7 cases only three are indicated as being accompanied by such complications. This discrepancy is due to the fact that in view of their condition four patients who were very ill were not examined with the laryngoscope.

Summarising the results set forth in tables I. and II. we find that in the cases of the lighter form of the 3rd. stage the general success of the treatment and the proportion of apyrexia was three times as great as in the cases of the more severe form of the 3rd. stage. Moreover, the influence of the pulse rate on the general result and on the subsidence of the fever is clearly shown, so that it may be said: The less the frequency of the pulse is affected by the fever and by the spread of the lung affection, so much the greater prospect of the success of the altitude treatment. In the same way, the influence of complications of all kinds may be observed in the tables. It remains to be mentioned that of the three cases of the severer form of the 3rd. stage, with severe tubercular complications, in only two was the improvement maintained for more than a year. In the case of only one patient is it likely that the result achieved will last. This patient was under treatment for seventeen months, and now after six months is still in the best of health. In the cases of the lighter form of the 3rd. stage with severe tubercular complication the results are still entirely gratifying.

The *nature and severity of the complications* is, of course, also of great import, as, indeed, may in part be seen from the above-mentioned tables.

Of the *slighter* complications in the case of fever patients, only those are dealt with which are capable of influencing the result of the alpine cure, especially in relation to the cessation of fever.

We have next to mention *pleurisies* and their *after-effects*. These occupy a position by themselves, and were therefore not included among the above-mentioned complications. On the basis of an extensive comparative study I have come to the conclusion that in severe pyrexial forms of the 3rd. stage, in which therefore the respiratory surface still capable of performing its functions is already reduced to a minimum, pronounced pleuritic deposits unfavourably influence the results of the treatment. With less extensive affection of the lung and at the same time the presence of pleural thickening, the prospect of cessation of the fever consequent upon the repose of the diseased lung is (supposing the circulation to be good) greater, or at any rate not less, than in the absence of such change in the pleura. These latter cases are well suited for the mountain treatment. Small dry pleurisies do not come into account here: they generally yield readily to treatment.

Bronchitis, which so often accompanies tuberculosis, also calls for our consideration. We must here distinguish between simple *inflammatory* bronchitis, whether of a tubercular or purely catarrhal nature, and *bronchitis due to engorgement*, such as is caused, on the one hand, by weakness of the heart, and on the other hand by *obstructed circulation* (emphysema, tumours, etc.). The first-named do not constitute factors which diminish the prospect of improvement. Bronchitis with engorgement, resulting from a weak heart, is, on the contrary, generally unfavourable. (In 10 cases only twice a brief improvement). Bronchitis with engorgement, especially when the accompanying em-

physema is not too severe and the heart has remained strong, offers, however, a better prognosis.

A decidedly unfavourable complication for fever patients is a pronounced *neurotic temperament*. The percentage of cases in which the fever subsides is considerably smaller for neurotic patients than for others (40%, as against 65.7%).

The position is precisely the same with reference to *anæmia*.

We cannot subscribe to the common view which attaches an almost fatal significance to the *diazo reaction*. In ten cases out of 22 which originally showed traces of this reaction we have seen the fever cease, improvement ensue, and the reaction disappear.

Finally, we must pay some brief attention to the *height* and *type of the fever*. Under otherwise similar conditions the prospects of cure for fever patients with F are smaller than for those with f. My 10 cases of F with hectic type, all had a negative result. Similarly the *typus inversus*, especially with F, seems to have prognostically an unfavourable significance. *Simple remittent* fever has, with F as well as with f, the best prognosis. *Intermittent* fever often points to incipient intestinal or renal tuberculosis, and is therefore in general less favourable.

A frequent accompaniment of fever is *sweating*, especially at night. For this there is no better remedy than altitude.

Hæmoptysis, which many still regard as a contra-indication, manifests itself differently according to the stage of the tuberculosis of the lungs. In the first and second stages hæmoptysis is of very rare occurence on the mountains. In the third stage it is only the severe pyrexial

forms with rapid pulse or other symptoms of heart weakness which are prone to hæmorrhage from passive congestion, as possibly happened with my patients. On the other hand, several of my patients in the third stage, most of them, indeed, afebrile cases, who until shortly before beginning the mountain cure were subject to repeated hæmorrhages, became quite free from them on the mountains. Apart, therefore, from the exception already mentioned, hæmoptysis is not a contra-indication.

To make indications and contra-indications dependent on particular *clinical forms* of pulmonary tuberculosis is in my opinion not feasible, if only for the reason that opinions with respect thereto are still very much divided.

We have now to deal with the effect of the mountain climate on the *tuberculosis of other organs.* As these are mostly of a secondary nature, they will be treated to a large extent in connection with tuberculosis of the lungs.

There is probably no treatment which favours regressive changes in *pleuritic deposits* so markedly as recourse to altitude. In practically all cases of this kind I have seen a considerable improvement set in. Certain writers have given support to the view that the more considerable exudates or extensive superficial adhesions are contra-indications. One may, however, safely allow oneself to be guided by the state of the pulse on the lines already indicated, and will then find that even considerable residues of former exudates are absorbed very quickly and thoroughly, and that adhesions for the most part stretch and disappear. I would, by the way, point out that large exudations are extremely rare on the mountains. Among my own patients I have never observed a case; so that puncture has never been necessary.

In *laryngeal tuberculosis* particular attention must be paid to the stage of the tuberculosis of the lungs with which it co-exists. In the first and second stages the prospect of the healing of laryngeal tuberculosis — whether the process be of an infiltrative or ulcerative nature — is very favourable. In febrile cases belonging to the severer form of the third stage, a complicating ulcerative tuberculosis of the larynx offers scarcely any likelihood of retrogression. For febrile cases of the lighter form of the third stage, the chances in this respect are greater. In the afebrile form of the third stage, in which the actual percentage of complicating laryngeal tuberculosis is smaller, laryngeal ulcers are much more easily healed than in the pyrexial form of the third stage. Simple tubercular infiltration of the larynx in slight cases of tuberculosis of the lungs may be definitely considered as an indication. Of 33 cases of this kind only two became worse (both belonging to the severer form of the third stage): the others improved, or were stationary. All patients with laryngeal tuberculosis who at home feel better in dry weather than in damp, can safely be sent to the high mountains, due regard being paid to the factors just dealt with. Severe dysphagia and bad irritable laryngeal cough are contra-indications. For the rest, readers are specially referred to the compilation of *L. Spengler's* cases by *Derscheid*, and to *Turban's* writings on the subject.

Tubercular affections of the *mucous membrane of the mouth* and of the *pharynx*, which, indeed, occur for the most part only in very far advanced tuberculosis of the lungs, scarcely come into account in the question of indications, and then only as aggravating circumstances. I have only seen two cases of ulceration of the mucous membrane of the mouth in patients suffering from severe pulmonary and intestinal disease. In the one instance the ulcer, which

was already regressing, was completely healed here; the other case was without prospect of improvement, and the ulcer showed no tendency to heal.

With regard to tubercular infection of the *nose*, I have twice observed *perforation of the septum* consequent upon tubercular ulceration in severe cases. Here they remained stationary.

Chronic tubercular and non-tubercular suppuration of the ear do extremely well on the high mountains. With the proper local treatment, I have cured or dried up all my 15 cases of chronic suppurating otitis media in a relatively short time. None of the patients in question had fever. In two severe cases with fever, local treatment was not resorted to, and the suppuration from the ear continued.

My experience of *surgical tuberculosis* is small. I have seen, however, three cases of tuberculosis of the knee-joint in lung patients (two 1st. and one 3rd. stage) improved under entirely conservative treatment. Also three cases of tubercular fistula, which were slow to heal after operation performed elsewhere, healed completely here, in one case under treatment by exposure to direct sunlight.

All cases of *tubercular swelling of glands* that have come under my observation, have been reduced, or have remained stationary; I have never known softening set in. I have had equally good experience with *scrofula*, which, together with other authors, I regard as a mitigated tuberculosis of the glands. I am referring entirely to children of tubercular parents, who have themselves given evidence of more or less pronounced tubercular change in the lungs. In respect to such cases the mountain and sea climates are certainly deserving of a higher reputation.

In *cutaneous lupus*, also, as I have experienced in two cases, the high mountain climate does much good. Simply

by means of solar radiation in winter, *Bernhard* healed in three weeks a very obstinate case of extensive scrophuloderma of the forearm, after the disease had been in existence for three years and had already been treated in various ways. He remarks further that in the last 15 years only three cases of facial lupus have been known in the Engadine, not one of which was acquired there. They all spontaneously healed without softening of the nodules.

Urogenital tuberculosis must always be regarded as a serious complication, and is by many placed among the absolute contra-indications. In the third stage of phthisis it is certainly such, as three of my cases go to show. In only one case of tuberculosis of the bladder and, later, of the kidneys, in a patient in the third stage of tuberculosis of the lungs, did the symptoms of the disease of these organs undergo abatement, and in this case the kidneys have now acted normally in the lowlands for a year and a half. Similar experiences are on record.

Bernhard, for example, in two cases of urogenital tuberculosis, effected improvement in the one case and cure in the other, and he cites a communication of Professor *Socin*, according to which a case of severe urogenital tuberculosis, in which creosote was used, healed on the high mountains. *Turban* mentions a case of vesical tuberculosis complicating tuberculosis of the lungs in the second stage, which was nevertheless brought to a successful issue upon disappearance of the fever. Hofrat *Turban* has also informed me of a considerable improvement in another severe case of urogenital tuberculosis treated on the mountains. *Eichhorst* has also noted considerable improvement of the general health, the local affection remaining stationary, in a case of renal tuberculosis, and in one of tuber-

culosis of the male genital organs, treated under similar conditions.

From all this it is evident that urogenital tuberculosis is not necessarily an absolute contra-indication, and that, if the general condition is good, and the tuberculosis of the lungs with which the disease is complicated is not too far advanced, the high mountain climate is able to accomplish something for such cases. That one must not lose the most favourable opportunity for operative interference is self-evident.

With regard to *intestinal and peritoneal tuberculosis*, I cannot share the view of many medical men, who entirely exclude such complaints. *Wolff*, among others, states that he has often had good results with tuberculosis of the intestines. *Turban's* statistics include two cases (apyrexial, it is true) of intestinal tuberculosis in lung patients (one 2nd. and one 3rd. stage), in both of which a lasting cure was attained. *Brecke* also reports a case of intestinal tuberculosis, in which the motions regained their normal character. In this complication, too, regard must above all be had to the extent of the pulmonary disease, and also to pulse and temperature. In severe cases of the third stage, with fever, complication with intestinal tuberculosis is an almost absolute contra-indication for the altitude cure. In ten cases of this kind a passing improvement was only twice attained. With a smaller extent of pulmonary disease, a successful result is more likely. Of 12 patients of this kind (11 of them pyrexial on admission), 4 entirely lost their intestinal trouble during treatment. Bad lung patients with chronic tubercular peritonitis have naturally nothing to hope for from the climate of high altitudes. I treated two such cases quite without result. One case of slight tocalized peritonitis complicating a slightly febrile tuber-

culosis of the lungs in the 3rd. stage, was completely cured.

Rectal fistula generally requires operation to ensure certain recovery: I have, however, known two cases of superficial fistula heal spontaneously, and, in the case of several patients, have brought about a considerable decrease of the secretion under conservative treatment. Operated fistula healed in one case completely, and in two had begun to heal when the patients left.

The *non-tubercular complaints* now to be dealt with may exist independently or as a complication of phthisis. In both instances the question of altitude treatment may come up, and will have to be answered accordingly.

Simple *chronic catarrhal inflammations of the upper air-passages* only concern us in so far that when there is special sensitiveness of the affected mucous membrane, the mountain climate often has an irritating effect upon it and may keep up a tormenting cough. By taking the proper measures, these troubles can as a rule be easily controlled, so that such lung patients need not be deprived of the advantages of our climate. *Chronic pharyngitis* and *rhinitis* are in this respect more easily influenced than *chronic laryngitis sicca. Chronic catarrhal otitis* and *tubal catarrh* are said to be favourably influenced by the mountain climate. Personally I have not been able to collect much information concerning them. On the other hand, I have cured by simple washing two cases (recent, it is true) of suppuration in the accessory sinuses: twice it was an affection of the frontal sinus and once an empyema of the antrum.

Something has already been said about *bronchitis* in conjunction with tuberculosis. *Chronic* inflammatory *bronchitis* of any kind is a very gratifying field for the moun-

tain treatment as long as the general health of the patient is good. Catarrh due to passive congestion may also diminish, provided that the cardiac force is capable of improvement. For a complete cure a residence of several months or even several years is necessary, according to the duration of the complaint and the age of the patient.

Of my lung patients suffering from bronchitis, 29 cases in the fever group belonged to the 3rd., and three to the 2nd. stage. Among the 29 cases in the 3rd. stage, there were 10 with catarrh from engorgement due to heart weakness. None of these cases improved — or, at most, there was temporary improvement in one instance. It was the same with 4 cases of inflammatory bronchitis in the 3rd. stage of phthisis. In a case of bronchitis from passive congestion consequent upon a uterine fibroid in a patient suffering from the slighter form III., the catarrh got worse with the growth of the tumour. In a case of the more severe form III. with emphysema, the catarrh improved. Of 13 cases with simple imflammatory bronchitis in the slighter form of the 3rd. stage, there was only one, with co-existing tuberculosis of the kidneys, which showed no improvement. Of the 3 febrile cases in the 2nd. stage, 2 improved in respect to the bronchial catarrh.

In the group without fever we find 31 cases in the 3rd. stage, of which only one (in consequence of a relapse) did not improve; 4 cases in the 2nd. stage, which were all more or less improved; and one case in the 1st. stage, which was completely cured. In 13 cases the catarrh was caused by emphysema.

One advantage of the mountain treatment which must not be undervalued is the fact that the sensitiveness of the bronchial mucous membrane is considerably reduced and often got rid of altogether.

So far as *bronchiectasis* is concerned, it is the opinion of some writers that the younger the individual and the better the state of the circulation, so much the greater the improvement to be expected. In a case of this kind I saw considerable improvement after two half-year cures; in another case, which, in addition, was complicated with tuberculosis of the lungs, severe emphysema, considerable pleural thickening, and degeneration of the cardiac muscle, the secretion was only slightly diminished. A case of *plastic bronchitis* which came within my experience was considerably improved on the high mountains.

The idea that *hay-fever* does not exist on the mountains is erroneous. I have known three patients, one with actual asthma, whose trouble was at least not mitigated in our high-lying valley.

True *asthma* is not often a complication of phthisis. Only two cases of this kind, with a minimal apical affection, have come under my treatment. Neither of these had paroxysms, or only slight ones; and in one patient the improvement was permanent after a return to the lowlands. I know, however, a number of asthmatical persons who have settled altogether on the mountains, and while here remain completely free from attacks. On the other hand, while practising in a sub-alpine district I took over for treatment a boy suffering from asthma, in whose case the high mountain climate had been ineffectual. In the literature of the subject I can find no certain indication as to what cases of asthma are suitable for this climate, and what cases are not. Some authors regard nasal asthma as unsuitable. For the rest, very good results of the altitude cure in bronchial asthma are reported by various trustworthy authorities.

Emphysema forms a contra-indication only in its severer form, especially when accompanied by disordered circulation and symptoms of heart weakness.

Veraguth, it seems, found that patients of his own, even with severe emphysema, felt better on the mountains than in the lowlands. In these cases the action of the heart must still have been good.

Among my own cases of tuberculosis of the lungs complicated with emphysema, in only one instance was the emphysema severe; moreover, the patient in question was handicapped with bad pleural thickening and bronchiectasis, and suffered rather badly from dyspnœa consequent upon pronounced weakness of the heart. The bronchial secretion was only slightly decreased, but the general health was so far improved that he gained 13.2 kilos in weight. Among 14 cases with moderately severe emphysema and chronic bronchitis, only three showed symptoms of degeneration of the cardiac muscle, and these suffered more here at Davos than lower down, and did not improve. In the other cases the catarrh and dyspnœa became better. Out of nine cases with slight emphysema and bronchitis, one very nervous lung patient in the 2nd stage, whose tuberculosis made unbroken progress in consequence of injudicious behaviour, did not show any improvement; the dyspnœa, on the contrary, became more intense. In the other eight cases, which were distributed over all the stages of pulmonary tuberculosis, the results with respect to increase of cardiac power, and diminution in the accompanying catarrh, and the tendency to dyspnœa, were really good. It can accordingly be affirmed that in the case of lung patients whose heart is in good condition, light and moderate emphysema is of no importance in deciding whether or not the high mountain treatment would be suitable.

Glimpse of the Davos Lake from the Dörfliberg

For *simple, non-tubercular chronic pneumonia* the high climate has been repeatedly recommended. I have myself not been able to obtain any experience in the matter.

The importance of good *heart action* for lung patients coming to the high mountains has already been discussed. Pronounced degenerative myocarditis is an absolute contra-indication, especially when there is dilatation of the ventricle. And in this connection it must not be forgotten that there are also forms of degeneration of the cardiac muscle which are distinguished by a remarkably slow but irregular pulse. Twenty-two of my patients suffered from inflammation or degeneration of the cardiac muscle, and 13 of these were in the severe form of the 3rd. stage. Only one of these 13 cases, and 4 of the other 9 underwent a transitory improvement; 20 died in a very short time; and for the two others the prognosis is absolutely bad. *Heart-disease with adequate compensation*, such as is also found in lung patients, is of no importance for our enquiry as to indications. I have treated four patients, with and without tuberculosis of the lungs, who had compensated defects, and who while here showed no cardiac symptoms. The same was the case with six patients who suffered from idiopathic hypertrophy of a single ventricle or of the whole heart. Only a case of cor bovinum with a pulse of 200 with simultaneous tuberculosis of the lungs did not stand our climate. On the other hand, in two cases of *fatty heart* (one complicated with tuberculosis of the lungs and the other appearing in a patient whose lungs were under suspicion), an improvement of the pulse and of the dyspnœa was recorded, and in one case was accompanied by diminution of the heart dulness.

On account of the danger of apoplexy, cases with pronounced *atheroma* are quite unsuitable for the high

alpine climate. As already mentioned, various writers are of opinion that aged people should be kept away from the mountains, and this view has its justification first and foremost in the case of patients with atheroma. *Aortic aneurysm* must be regarded in all instances as an absolute contra-indication.

Nephritis is equally unsuitable for our climate, when complicated with tuberculosis of the lungs, as was my experience in two bad lung cases. Slight *albuminuria* of toxic origin, such as sometimes occurs in tuberculosis, is by some not included among the contra-indications. I have seven times observed albuminuria of this kind in lung patients with fever: only twice did it persist after the fever had disappeared. One of these patients made a brilliant cure; the other became worse owing to intercurrent tuberculosis of the intestines. In the case of four lung patients with amyloid kidneys there was nothing particularly noteworthy, save that in two cases the course was very slow.

Nervous and catarrhal disorders of the stomach and intestines form a favourable object for high mountain treatment. It is well known how frequently lung patients suffer from an anorexia that defies all treatment in the lowlands. Sending the patient into the mountain air generally suffices to revive the lost appetite, often to an unexpected extent. I would only mention that practically all my patients of recent years who were without fever, and for whom an increase of weight seemed to me desirable, did increase in weight without any medical aid. Further, old-standing gastro-intestinal catarrh in phthisis, formerly perhaps a source of suffering to the patient for months at a time, has, if definitely non-tubercular, been invariably improved or cured by comparatively simple means. Seven cases of very obstinate intestinal catarrh in lung

patients at all stages were thus healed, and a case of nervous diarrhœa in a patient who, in addition to pulmonary tuberculosis in the first stage, suffered from severe hypochondria, was at any rate ameliorated. Nervous disorders of the stomach were also very favourably influenced. The tuberculosis in all these cases was certainly slight in character. Of 36 patients with nervous dyspepsia, who were as a rule free from pyrexia, only two 1st. stage patients with severe neurasthenia, and four very anæmic patients in the 3rd. stage with progressive pulmonary disease, failed to improve.

Two patients with alcoholic gastritis also experienced an improvement of their stomach troubles. Finally, I would point out that in the mountains febrile patients take their food with less difficulty than in the lowlands.

I have also seen good results in *constipation*. The possible inspissation of the contents of the intestine occasioned by the dryness of the air, is easily compensated by taking larger quantities of liquid; in addition to which, the stimulation of the metabolic processes has a decidedly favourable effect on the activity of the intestines. Of the many cases of constipation which came under my treatment, there was only one now and again which was not so far improved that artificial aid could be dispensed with. Indeed, two patients (female), with constipation due to atony, who at home had for months and years together tortured themselves with the most severe remedies in order to regulate their digestion, and who came here extremely emaciated and with complete loss of appetite, obtained forthwith regular action of the bowels, in the one case in spite of high fever. The other, who was moreover an hysterical patient, certainly had a relapse which necessitated some therapeutic intervention. Also in a case of membranous

colitis in a patient with severe hysteria, who came under my care in a pitiable condition after trying various water cures without avail, a considerable improvement of the general health and of the action of the bowels was effected after superalimentation, local treatment with massage, and oil injections. *Hæmorrhoids* generally improve under regular diet.

The round *gastric ulcer*, with which, however, lung patients are seldom troubled, may, in Turban's opinion, be regarded as a contra-indication, if only for the reason that persons so afflicted, when on restricted diet, are not able to satisfy the increased appetite induced by the climate, or, when not, suffer from the larger amount of food taken.

Concerning the effect of altitude on *liver complaints*, I have not been able to find anything in the literature on the subject. *Hepatic cirrhosis*, which I found to exist in the case of some alcoholic patients, showed no peculiarity in its course. As I had good results with the usual conservative treatment in seven cases of cholelithiasis in tubercular and non-tubercular patients, it seemed to me not impossible that the climate had contributed somewhat to this end. *Turban* also mentions two cases of the kind which progressed favourably.

Just a few remarks concerning *non-tubercular affections* of the urogenital system. Altitude seems to have no affect on *chronic gonorrhœa*. In spite of partial local treatment, two of my lung patients with such complication underwent no improvement. The same result ensued with a case of cystitis of gonorrhœal origin. Lindemann, among others, claims to have observed a favourable effect exercised by altitude on *gynæcological affections*, especially on anomalies of menstruation and on leucor-

rhœa. That menstrual disturbances may disappear with the improvement of the general health is an old experience which I can also confirm. Improvement of leucorrhœa of anæmic origin has also been repeatedly experienced by my patients. I have not had more extensive experience of affections of this nature. *Turban* has arrived at good results in his cases of this kind, with application of suitable local treatment. Altitude has no special influence on the course of pregnancy. One would not of course permit women far advanced in pregnancy to travel into the mountains — or anywhere else — unless for urgent reason.

With reference to *eye complaints*, I will only mention that according to a communication for which I have to thank Dr. Dönz (Davos), trachoma is very favourably influenced by the high mountain climate.

Non-tubercular affections of the skin I have only seldom seen. With respect to simple eczema, there was nothing special to mark. Furuncles and other varieties of purulent inflammation of the skin were remarkably rare among my patients. *Veraguth* has seen surprisingly good results ensue in chronic furunculosis. I have, moreover, been able to observe the rapid healing of superficial and other wounds. This fact, proved by old experience, which has again of late been confirmed, especially by *Bernhard* (Samaden), might be more often taken advantage of for the benefit of those undergoing operations. It seems to me worth mentioning that in the whole of his practice Bernhard has experienced no case of secondary infection after surgical treatment. The results which he has achieved, even with large superficial wounds, by exposure to the direct rays of the sun, are really astonishing.

Something may also be said in this place with respect

to the behaviour of *scoliotic* patients on the mountains. In three out of five cases Egger observed greater respiratory difficulty at high altitudes. I myself treated two patients of this kind, who had tuberculosis of the lungs in the 1st. stage, with good pulse (1st. group), and these were either not troubled at all or not more than in the lowlands. In such cases, again, all depends on the state of the heart.

Passing on now to complaints of a more general character, we may deal in the first place with *anæmia*. As is well known, this affection is very often combined with tuberculosis of the lungs. Indeed, obstinate anæmia is very often nothing else than a symptom of latent tuberculosis. But, besides this, genuine chlorosis or some one of the well defined diseases of the blood may arise during pulmonary disease. Now both for independent, primary anæmia, and anæmia with tuberculosis, the mountain climate has from of old been regarded as a most effective remedy. In anæmic lung patients I have not only almost always seen really surprising improvement of the anæmia, but have also found that, in respect to their tuberculosis, non-feverish anæmic patients often recovered remarkably well and quickly, so that the improvement of the anæmia and that of the lung complaint kept pace the one with the other. The quite exceptional cases in which the anæmia became no better, or only slightly better, were for the most part the subjects of grave pulmonary disease, or suffered from serious complications, especially of the intestines. There are, however, among tubercular patients, some anæmic invalids who do not become habituated to the high climate, who are always cold, and also make no progress with regard to their lung complaint. It is necessary to send such patients to some lower altitude. Chlorosis and other forms of anæmia in non-tubercular pa-

tients I have not often seen. Such complaints are at any rate rare among the native population.

The following results were obtained on examining my material with respect to the history of anæmic patients: The whole of the 118 cases of anæmia in the 1st. and 2nd. stages, which included 11 belonging to the severer grades, were improved or cured. In the 3rd. stage, 39 pyrexial cases showed the type of bad anæmia. Of these, 16 were improved, all except three belonging to the group of light cases. Of the 23 which did not get better, 15 were in the more severe form of the 3rd. stage, and 8 had severe complications, especially (in 5 instances) tuberculosis of the intestines. Of the 37 pyrexial cases with slight anæmia, 27 were improved (including 7 cases in the severer form of the 3rd. stage), and 10 not improved. Of these latter, 8 belonged to the severer 3rd. stage; the other two suffered from intestinal tuberculosis. Of the 33 apyrexial cases in the 3rd. stage, with anæmia, 14 of which must be counted as belonging to the more severe grades, all were improved with the exception of one very neurotic patient.

The more severe forms of essential anæmia, such as *leucæmia, pseudo-leucæmia* and *pernicious anæmia* are absolute contra-indications. I will only mention that in a case of splenic leucæmia I observed an (unfortunately transitory) increase of the red corpuscles, with considerable decrease of the enormous enlargement of the spleen.

Sufferers from the various forms of *nervous disease* form a large contingent of those who come to the mountains in search of alleviation and healing of their complaints. So far as tubercular patients without fever are concerned, by far the greater number experience a retrogression of their nervous troubles, coincident with the improvement in their general health, and abatement of the

lung symptoms. It does, however, also sometimes happen that in spite of the improvement of the lungs the nervous disturbances remain unaffected or even become worse. It cannot a priori be determined which of these eventualities is to be expected. Some authors assert that hereditary neurasthenia has less chance of success than the acquired form. *Laquer* holds that the sthenic forms alone are suitable. In *psychoneuroses* and *psychoses* no direct influence from the climate is to be hoped for. With respect to nervous affections, my own cases have yielded the following results:

As to true *neurasthenia*, I have met with 49 cases in the 1st. stage of tuberculosis of the lungs, 12 with and 37 without fever, two of the former being extremely neurotic. Of all these patients, only three did not get better here: in one case there was a remarkable improvement in general health, which did not, however, show itself until the patient had returned to the lowlands after the cure; the second was a neurasthenic patient much depressed by reason of chronic gonorrhoæa; the third was a malcontent.

Of the cases in the 2nd. stage of phthisis, 53 were troubled with nervousness; 25 were admitted with fever, of whom two had severe neurasthenia. One of these two severe cases, as well as 5 slightly neurasthenic patients, underwent no improvement; in three out of the latter 5 the lung process was progressive; one patient suffered from a good deal of worry; and in the last case improvement only became evident after the cure.

In the 3rd. stage, 134 cases showed more or less pronounced nervous symptoms. Of the 52 cases of this kind without fever, five were troubled with severe neurasthenia. Of these latter, only one patient, who was also very

anæmic, did not improve. The 47 slightly neurotic patients with tuberculosis of the lungs in the 3rd. stage, without fever, recovered, so far as their nervousness was concerned. Of 82 patients with fever, 18 of whom were highly neurasthenic, 47 (including 12 very neurotic cases) obtained no alleviation of their trouble. All were very ill (32 with severer form of 3rd. stage; 15 with bad complications or uninterrupted progress of the disease.)

On the other hand, one febrile case in the 3rd. stage — severer form — with hypochondriacal neurasthenia, was considerably improved in respect of the nervous disorder.

I had 10 cases of *hystero- neurasthenia* (8 in the 1st., and 2 in the 3rd. stage). Three of these patients had fever on admission. All 10 obtained an amelioration, often considerable, of their nervous condition.

Pure hysteria I observed only twice in the 1st. stage: the case already mentioned as suffering from membranous colitis was considerably improved; in the other case, in which amor lesbicus supervened, nothing was achieved. Furthermore, a patient in the 3rd. stage, seriously ill, and with bad complications, also showed symptoms of hysteria, which also, of course, were not influenced. In a case of severe hysteria with a condition of melancholic depression in a patient (lady) with a slight apical affection which was proceeding favourably, the climate seemed to exercise a directly irritating effect. At any rate, in spite of all psychotherapeutical measures, the attacks of hysteria were more frequent here than in the lowlands.

In a case of pure *hypochondria* in a febrile patient in the 1st. stage, there was no improvement; whereas in a case of slight *melancholic depression* in a febrile patient in the 3rd. stage — severe form — improvement of the

general health and of the lung affection was accompanied by amelioriation of the psychical condition.

Sleeplessness occurred, in the case of all these nerve patients, chiefly during the period of acclimatisation, but even insomnia of longer duration never reached an unbearable degree. As *Egger* and *Löwenfeld* have also noticed, the deficiency of sleep was generally borne remarkably well. The greater number of patients of this class slept decidedly better during the cure. The mental attitude of the patient is also of great significance for the result. Crass egoists, the everlastingly discontented, the frivolous, and those depressed by care and worry, as also such as suffer from incurable homesickness, cannot expect to derive advantage, either for their nervous system or for lung trouble, from any treatment whatsoever, not even from a cure in the high climate, if they cannot be educated by psychic influence.

A case which also seems to me to be worth mentioning was one of severe hereditary hystero-neurasthenia in a very anæmic, non-tubercular youth of 17, who underwent considerable improvement, not only in the matter of severe attacks of tachycardia, but also of disturbed sleep and anæmia, as well as of general health.

Epilepsy is generally regarded as a contra-indication. I have had no personal experience in this connection.

In *Graves' disease* the results are favourable, as is repeatedly emphasised in the literature of the subject. I myself have known a severe case gradually cured by years of residence on the mountains. A slight non-tubercular case (lady) of Graves' disease was considerably improved. In combination with phthisis it is, according to a communication of Hofrat Turban, a contra-indication, as being without prospect of recovery. Three cases of this

kind which ran an unfavourable course, are cited in his statistics. In one of my lung patients (lady), in the 1st. stage, with suspicion of Graves' disease, the heart trouble was improved by two visits to the mountains.

With regard to *syphilis*, it is to be remarked that it is rather frequently combined with tuberculosis. In the case of advanced forms of tertiary syphilis the tendency to connective-tissue changes which it brings about may possibly exercise a directly healing effect on the tuberculosis of the lungs, an effect to which the mountain climate is entirely favourable. I have witnessed a very remarkable case of this kind in a pyrexial lung patient in the second stage, with long-standing tertiary syphilis. The lung symptoms abated with remarkable rapidity, and the tubercle bacilli disappeared from the sputum, while in a brief space of time various inflammatory affections of certainly syphilitic nature made their appearance (perityphlitis, thrombophlebitis of both legs, iritis, neuritis and haemorrhagic nephritis). Syphilis accompanied by ulceration and formation of gummata is, however, a grave complication, especially for lung patients in the 3rd. stage. In the case of three febrile patients in the severe form of this stage, who suffered from syphilitic affections of this kind, the downward course of the disease could not be arrested. It is, however, in cases of slight tuberculosis of the lungs with syphilis that a good result is most likely to be obtained, as is shown by *Turban's* statistics. In the case of lung patients with latent or healed syphilis there was nothing special to record. Anæmia and cachexia of syphilitic origin were generally improved or cured on the mountains.

Malarial diseases offer a very favourable field for the high mountain cure. In my 4 cases of phthisis coexisting with active malaria, the fever was got rid of in a com-

paratively short time, and a remarkable improvement in the state of the lungs was realised. I myself immediately lost, on the mountains, malaria acquired in the tropics. Some cases of old cured malaria in lung patients ran a perfectly ordinary course. It is one of the oldest therapeutical experiences that uncomplicated malaria and its after-effects can be cured on the mountains. I remember a case of severe malarial neuralgia in which relief could only be found at such altitudes.

The high alpine climate has a bad reputation in respect to its effect on a *rheumatic* tendency. On the whole, this opinion is not without justification. It is, at any rate, to be recommended that pronounced sufferers from rheumatism, whether tubercular subjects or not, should be dissuaded from staying on the mountains. It is not necessary, however, to be over-anxious in this respect. In a case of severe phthisis I have even seen complete disappearance of general articular and muscular rheumatism which had first made its appearance here. I have never known one of my patients who had formerly got better of rheumatism of the joints undergo a relapse here. Slight rheumatic pains in the muscles do frequently occur, but are easily dealt with. I have never found myself compelled to send a patient away on account of rheumatic complaints. On the other hand, I know non-tubercular rheumatic subjects who, with a little care, are able to live quite well on the mountains. There are even rheumatic persons who assert that they are less troubled by their affliction on the mountains, in the middle of summer at least, than in the lowlands (see e. g. Regnard).

In slight diabetes, even when it occurs in tubercular patients, residence on the high mountains is thoroughly to be recommended. *Turban* states that in some cases of

diabetes the amount of sugar in the urine was reduced to the merest trace without rigorous diet, the weight at the same time increasing or remaining stationary. I have myself twice had an experience of this kind. Severe forms of diabetes derive no advantage from altitude. In one case, in which there were at one and the same time tuberculosis of the lungs in the severe form of the 3rd. stage, active tertiary syphilis, and severe diabetes, I observed a very rapid extension of the pulmonary disease, such as I had never seen before.

Gout is regarded by some medical writers as suitable for the altitude cure. One of my patients who, in addition to his tuberculosis (2nd. stage, without fever), was attacked by gout, suffered less while on the mountains than in the lowlands. An elderly lady of my acquaintance who is subject to gout, was quite free from attacks during her stay of some months with us at Davos.

Obesity also well repays treatment in the high alpine climate. In all my 10 cases of this kind, of which 9 were tubercular, I was able to bring about a reduction of weight by simple therapeutic means, and without any trouble whatever. Indeed, I regard the mountain treatment as quite specially indicated for obesity with tuberculosis, having regard to the lowered metabolic activity met with in such cases.

It is worth mentioning that *rickets* is extremely rare among children whose parents live on the mountains, and the alpine climate has therefore been often recommended for this disease. I only once had to treat the child of a lung patient for rickets, and then with the best results.

From of old the mountains have been resorted to in *debility* of all kinds, and in convalescence after exhausting illnesses: and with good reason.

If we now summarise the facts we have thus ascertained, arranging them as A) Certain Indications, B) Doubtful Indications, and C) Absolute Contra-Indications, we arrive at the following results:

A. CERTAIN INDICATIONS.

1. PROPHYLAXIS OF TUBERCULOSIS (hereditary taint, defective formation of thorax, habitus phthisicus, debility after illnesses predisposing to tuberculosis, such as measles, whooping cough, scrofula, influenza, etc.).

2. MANIFEST TUBERCULOSIS in all stages, without fever, provided that the pulse during rest is not higher than 100 and that its quality affords satisfactory guarantee. Febrile patients in the 1st. and 2nd. stages with maximum temperature below 38.5° C. have good prospect of getting rid of the fever on the mountains and of obtaining permanent good results. Cases in the 3rd. stage with slight fever of no long standing (maximum temperature under 38.5°), with the lung affection extending to less than three lobes, and with good circulation, have excellent chances of success in the high climate, provided there are no severe complications (among which severe neurasthenia and anæmia must be included). Hæmoptysis is extremely rare on the mountains in the 1st. and 2nd. stages; in the slighter form of the 3rd. stage the danger of a recurrence of the bleeding is very small as long as the action of the heart is good.

3. CHRONIC PLEURISY WITH RESIDUAL EXUDATE or thickening, provided the pulse is good.

4. CHRONIC BRONCHITIS of tubercular or non-tubercular nature, if not the result of severe emphysema or weak heart.

5. CHRONIC PNEUMONIA of non-tubercular character, always provided the heart-action is good.

6. NERVOUS ASTHMA.

7. LARYNGEAL TUBERCULOSIS, especially the form with infiltration. The ulcerative type only in cases in which the tuberculosis of the lungs has not exceeded the limits prescribed above.

8. SLIGHT FORMS OF INTESTINAL TUBERCULOSIS, with the same limitation with regard to the tuberculosis of the lungs as in 7.

9. CHRONIC SUPPURATION OF THE MIDDLE EAR, both of tubercular and non-tubercular nature.

10. TUBERCULOSIS OF THE BONES AND GLANDS. SCROFULA.

11. CUTANEOUS TUBERCULOSIS. LUPUS.

12. CHRONIC SUPPURATION OF THE ACCESSORY SINUSES OF THE NOSE.

13. TRACHOMA.

14. DIFFICULTLY HEALING WOUNDS OF ALL KINDS.

15. CHRONIC OR NERVOUS CATARRHS OF THE INTESTINES AND STOMACH. CONSTIPATION.

16. SLIGHT AND MODERATELY SEVERE FORMS OF ANÆMIA.

17. SLIGHT AND MODERATELY SEVERE FORMS OF NEURASTHENIA, principally the acquired and sthenic forms.

18. GRAVES' DISEASE.

19. SYPHILIS, especially the advanced forms of tertiary syphilis, and syphilitic cachexia.

20. MALARIA and its after-effects.

21. MILD CASES OF DIABETES.
22. GOUT.
23. OBESITY.
24. RICKETS.
25. CONVALESCENCE after exhausting illnesses, and such other forms of debility as have not already been dealt with in connection with prophylaxis.

B. DOUBTFUL INDICATIONS.

These may be created by combinations of two or more of the diseases scheduled among the indications. To these must be added all moderately severe forms of tuberculosis of the lungs accompanied by fever, especially those with tubercular complications. Here we must include the lighter cases of urogenital tuberculosis, severe anæmia, severe neurasthenia, moderate emphysema, and, in general, all such cases as belong neither to the Certain Indications nor to the Absolute Contra-Indications.

C. ABSOLUTE CONTRA-INDICATIONS.

1. SEVERE TUBERCULOSIS OF THE LUNGS where the pulse-rate is always 120 or more during rest, or where with a lower pulse-rate there is a pronounced tendency to dyspnœa. Fever cases, especially with maximum temperature of 38.5° C. or more, with disease of 3 lobes or more (severe forms of 3rd. stage). Hectic fever and typus inversus seem to be unfavourable. Hæmoptysis in severe pyrexial tuberculosis of the lungs with symptoms of weak heart.

2. SEVERE ULCERATIVE LARYNGEAL TUBERCULOSIS, especially in severer cases, of the 3rd. stage.

Laryngeal tuberculosis with bad irritable cough or dysphagia.

3. SEVERE TUBERCULOSIS OF THE INTESTINES AND PERITONEUM, especially with simultaneous severe tuberculosis of the lungs.

4. SEVERE RENAL TUBERCULOSIS, especially in advanced pulmonary disease.

5. SEVERE EMPHYSEMA ACCOMPANIED BY BRONCHITIS from passive congestion.

6. NON-COMPENSATED CARDIAC LESIONS. MYOCARDITIS. DEGENERATION OF THE CARDIAC MUSCLE, especially with dilatation of the ventricle and ATHEROMA.

7. CHRONIC NEPHRITIS.

8. SEVERE ARTICULAR AND MUSCULAR RHEUMATISM and great tendency to rheumatic affections.

9. SEVERE DIABETES.

10 SEVERE GOUT.

11. LEUCÆMIA, PSEUDO-LEUCÆMIA. SEVERE ANÆMIA. PERNICIOUS ANÆMIA.

12. SEVERE CONGENITAL NEURASTHENIA, NEUROPSYCHOSIS AND PSYCHOSIS PROPER.

Table I. *Pyrexial Cases of the Slighter Form of Stage III.*

(Involvement of less than three lobes.)

	Cases classified according to pulse-rate			Cases with severe tubercular complications [Larynx, intestine, peritoneum, urogenital system]			Cases either uncomplicated or with only slight complications, tubercular or otherwise [Bronchitis, emphysema, slight tuberc. affections of glands, bones, and skin; otitis, rectal fistula, etc.]		
	Class I. %	Class II. %	Total %	Class I. %	Class II. %	Total %	Class I. %	Class II. %	Total %
Improvement [local and general]	20=80.0	13=65.0	33=73.3	10[1]=66.7	5[2]=50.0	15=60.0	10=100.0	8=80.0	18=90.0
No Improvement or only gen. and no local impt.	5=20.0	7=35.0	12=26.7	5[3]=33.3	5[4]=50.0	10=40.0	0= 0	2=20.0	2=10.0
Total	25	20	45	15	10	25=66.6 % of total	10	10	20=44.4 % of total
Disappearance of fever	17=68.0	11=55.0	28=62.2	8[a]=53.3	5[b]=50.0	13=52.0	9= 90.0	6=60.0	15=75.0
Persistence of fever	8=32.0	9=45.0	17=37.8	7[c]=46.7	5[d]=50.0	12=48.0	1= 10.0	4=40.0	5=25.0
Total	25	20	45	15	10	25	10	10	20

[1]) 7 Infiltrn. of larynx
1 Ulcern. „ „
2 Intestinal tub.
[1 with infiltrn of lar.]

[2]) 1 Infiltrn. of larynx
1 Ulcern. „ „
2 Intestinal tub.
1 sacculn. of periton.

[3]) 1 Infiltrn. of larynx
1 Ulcern. „ „
3 Intestal tub.
[with infiltrn. of lar.]

[4]) 1 Infiltrn. of larynx
3 Intestinal. tub.
1 renal tub.
with infiltrn. of lar.

a) 5 Infiltrn. of larynx
1 Ulcern. „ „
2 Intestinal tub.
[with infiltrn. of lar.]
b) See 2.

c) 3 Infiltrn. of larynx
1 Ulcern. „ „
3 Intestinal. tub.
[with infiltrn. of lar.]
d) See 4.

Table II. *Pyrexial Cases of the Severer Form of Stage III.*

(Involvement of three or more lobes.)

	Cases classified according to pulse-rate				Cases with severe tubercular complications				Cases either uncomplicated or with only slight complications			
	Class I. %	Class II. %	Class III. %	Total %	Class I. %	Class II. %	Class III. %	Total %	Class I. %	Class II. %	Class III. %	Total %
Improvement [local and general]	10=55.5	7=35.0	0= 0	17=35.4	2[1]=25.0	1[2]= 9.1	0 = 0	3=11.5	8=80.0	6=66.7	0= 0	14=63.6
No Improv. or only gen. and no local impt.	8=44.4	13=65.0	10=100	31=64.6	6[3]=75.0	10[4]=90.9	7[5]=100.0	23=88.5	2=20.0	3=33.3	3 =100.0	8=36.4
Total	18	20	10	48	8	11	7	26=54.2 % of total	10	9	3	22=45.8 % of total
Disappearance of fever	5=27.8	6=30.0	1= 10.0	12=25.0	1[a]=12.5	1[b]= 9.1	1[c]= 14.3	3=11.5	4=40.0	5=55.6	0= 0	9=40.9
Persist. of fever	13=72.2	14=70.0	9= 90.0	36=75.0	7[d]=87.5	10[e]=90.9	6[f]= 85.7	23=88.5	6=60.0	4=44.4	3=100.0	13=59.1
Total	18	20	10	48	8	11	7	26	10	9	3	22

1) 1 Infiltrn. of larynx
1 Intestinal tubero.

2) 1 Ulcern. of larynx

3) 1 Infiltrn. of larynx
2 Ulcern. of larynx
(1 with syphilis)
3 Intestinal tub.
(1 with Infiltrn. of lar.
1 with „ „ „ with renal tub.)

4) 3 Infiltrn. of larynx
4 Ulcern. of larynx
3 Intestinal tub.

5) 3 Infiltrn. of larynx
4 Ulcern. of larynx
(with syphilis)
2 Intestinal tub.
(with Peritonitis)

a) Infiltrn. of larynx

b) see 2,

c) Infiltrn. of larynx

d) see 3
also 1 intestinal tub.

e) see 4

f) 1 Infiltrn. of larynx
3 Ulcern. of larynx
(with syphilis)
2 Intestinal tub.
(1 with Peritonitis)

Table A.

Pyrexial Cases with Involvement of More than Three Lobes.

	Cases classified according to pulse-rate				Cases with severe tubercular complications				Cases without manifest complications			
	Class I. %	Class II. %	Class III. %	Total %	I.	II.	III.	Total	I.	II.	III.	Total
Improvement	0= 0	0= 0	0= 0	0= 0	0	0	0	0	0	0	0	0
None	1=100.0	2=100 0	4=100.0	7=100.0	0	1[1]	2[2]	3	1	1	2	4
Fever disapp.	0	0	0	0	0	0	0	0	0	0	0	0
Fever persist.	1	2	4	7=100.0	0	1	2	3	1	1	2	4

1) Intestinal tub. with Infiltrn. of larynx

2) Intestinal tub. with peritonitis Ulcern. of larynx

THE HIGH MOUNTAIN TREATMENT OF PHTHISIS.

BY DR. E. NIENHAUS.

The climatic treatment of phthisis is as old as medicine itself. Even *Hippocrates* recommended his patients a change of air. *Celsus* and *Aretaeus* prescribed sea voyages for phthisical patients who were strong enough to undertake them, as also residence by the seaside and, during summer, in the country. *Pliny* the Elder laid special stress on sunshine, and on the value of the air in pine-woods. *Galen* sent his lung patients into the mountains for the milk cure, teaching that such invalids did best in the dry and particularly pure mountain air. This opinion remained authoritative until well on in the Middle Ages, and the later physicians, such as *Gregory*, *Laennec*, *Hufeland*, *Schönlein*, and others, were all convinced of the value of climatic cures, whether in the more humid sea air or in the dry air of the mountains.

Of great importance was the hypothesis supported by Fuchs, Tschudi, Mühry, and others, that the inhabitants of the mountains at a certain elevation above the sea were immune against tuberculosis. (Quoted by Dettweiler).

Brehmer later on made this assumption part of the basis of a new method of treatment.

Although it has not been possible to uphold this theory of an area absolutely immune against tuberculosis, yet nowadays nearly all investigators recognise a re-

lative immunity in high-lying places. The limit of immunity varies according to geographical latitude. *Brehmer* gives it as a minimum altitude of 500 metres above sea-level for Central Germany, as 500—1700 for Switzerland, and 3000—4000 metres for the equator. The fact borne out by the statistics of *Brockmann, Brehmer,* the *Swiss Commission for the years 1656—69, Imfeld and Schmid* — that, on the whole, phthisis decreases with increase of elevation is explained by *Schröder* as due to diminishing density of population. The industries also, which do so much harm elsewhere, are lacking on the mountains; the inhabitants, follow healthy occupations, are much in the open air, and with respect to housing and drinking-water are better off than the population of the industrial centres in the plains. On the other hand, it is to be noted that all authorities are agreed that in the populous centres of industry on the Andes: Puebla, Mexico, Anito, Bogota, which are all situated at an elevation of from 2300 to 2850 metres above sea-level, tuberculosis is very rare among the inhabitants as a whole, and has not been observed at all among the native element. The towns mentioned do not, however, rejoice in the best hygienic conditions.

Turban publishes similar observations concerning the Canton of the Grisons. Here there are, it is true, no large towns or industrial districts; but there are closely-built villages at a height of 550—700 m. in the so-called "Herrschaft" and the Prättigau, from 800 to 1600 m. in the Oberland, and 1000—1800 m. in the Engadine. It is easily calculated from official statistics concerning the distribution of tuberculosis in the Canton that in the places lower than 1000 m., 10.9 % of the population suffer from tuberculosis, whereas in those above 1000 metres the percentage is only 6.8, and this although the health-resort

of Davos, visited yearly by thousands of consumptives, belongs to this latter group.

Davos itself affords a proof of the relative immunity of the high mountains.

Such idyllic conditions as are described by Peters, exist no longer; Davos has continued to grow, and since 1850 the population has risen from 1680 to 5000, although the resort certainly still has the appearance of a town composed of villas. Of the new residents the greater number are persons suffering from tuberculosis, who have settled down in the Alpine valley of Davos on account of their health, and now dwell among and live in intimate relation with the native population. And yet in spite of this, the mortality from tuberculosis, as the statistical compilation made by *Aebi* shows, has not increased either among the population in general or among the burgesses of the Commune of Davos, but has remained about the same. Despite the influence of the heath-resort, the hygienic conditions prevailing in the genuine peasant homes are far from ideal; an open window affording sufficient ventilation is very seldom seen, and what the country inhabitants carry with them into the houses from their work, on their clothes and their boots, certainly does not serve to improve the atmosphere.

After this positive testimony concerning the relative immunity of high-lying places from tuberculosis, we can very well accept without hesitation the assertion made by *Egger*, that under similar social conditions there are fewer deaths from tuberculosis in elevated places than in the plains.

That in high-lying districts there should be a smaller number of people falling ill of tuberculosis than is the case in non-mountainous districts, can only be explained by

calling to mind the factors which distinguish the climate of high altitudes.

With elevation above the sea-level the climate undergoes characteristic changes. The physical peculiarities which lend the mountain climate its character are the following:

1. The rarefaction of the air, caused by the diminished atmospheric pressure;
2. The lower temperature;
3. The intensity and long duration of heat and light from the direct rays of the sun;
4. The diminished humidity of the atmosphere;
5. The purity of the air;
6. The small amount of cloud and fog, especially in winter;
7. The movements of the air;
8. The greater quantity of atmospheric electricity and radio-activity . . .

A detailed account of the meteorological conditions prevailing in the Davos Valley are to be found in another part of this book.

In order to comply with present-day requirements, a mountain health-resort must be able to boast more than mere altitude: it must have air free from dust, it must be favourably exposed to the sun in a not too narrow valley, which must be enclosed by mountains of such formation as to afford shelter from the wind and yet permit long duration of sunshine. A low degree of atmospheric humidity, a small amount of cloud, little and quickly-passing (though sufficient) rain and snowfall, infrequent fogs, and in winter an enduring covering of snow, are also necessary. That our Davos Valley meets all these requirements is beyond doubt.

Passing on now to consider the effect which the Alpine climate exercises on the body of both healthy persons and of invalids, and especially on those whose lungs are affected, it is in the first place to be observed that different investigators have endeavoured to make a separate study of the influence of the various components of the high climate. The rarefaction of the air is doubtless one of the most important factors in relation to the effect of the climate on the human system; but various other factors, such as the dryness and purity of the air, and the solar radiation, are essentially associated with it in producing this effect. It is therefore preferable to consider the operation of the mountain climate as a whole, giving the greatest possible attention to the several factors.

Respiration becomes in many persons more frequent on coming from the lowlands to the mountains, but only for a short time. An adaptation to the new circumstances gradually takes place, and the number of inspirations in a given time is reduced. A. Löwy, J. Löwy and L. Zuntz were able to observe this in themselves during a scientific expedition on Monte Rosa.

That the diminished air-pressure plays the principal part in producing this effect is shown by the fact that an increase in the rate of breathing can also be brought about in the rarefied air of the pneumatic chamber.

It should also be mentioned that in the case of persons who are not acclimatised, muscular activity (walking) is accompanied by considerably greater frequency of respiration than in the lowlands.

The respiratory capacity, i. e., the quantity of air breathed per minute, also increases; though, on the other hand, one does not breath so deeply on first coming up into the mountains. After some time an adjustment takes

place, and the respiration may even become deeper than it was in the lowlands.

According to a more recent publication by *Jaquet*, the increase in the volume of air inspired on the high mountains is due entirely to the greater frequency of inspiration; after reduction of the volume of air to 0° C. and 760 mm., the quantity of air expired in the time-unit appears notably diminished.

The vital capacity of the lungs first of all undergoes a temporary decrease; but this only lasts two or three days, and then after further residence on the mountains it regularly increases, even to an extent which never occurs in inhabitants of the lowlands, as has been proved by *Löwy*, *Schumberg-Zuntz*, and especially *Mosso*.

After systematic measurement of several hundred patients at the Basle Sanatorium, Davos-Dorf, I have found that in the case of phthisical subjects the increase of the amplitude of respiration is perfectly regular, except in cases of advanced disease, or when there is a high degree of pleural thickening in elderly people. It follows from what has just been said that on the high mountains greater demands are made on the respiratory muscles. The result, even during repose, is tantamount to breathing exercise, which is correspondingly increased by muscular effort. In intimate connection with this effect is an improvement of circulation and nutrition in the lungs, which may be of great importance in disease of these organs. If insufficient nutrition in consequence of defective circulation in the apices of the lungs be regarded as a cause of phthisis, the improvement of the circulation must *ipso facto* be a remedy against phthisis, or at least a powerful adjunct.

Not only the pulmonary, but also the *systemic circulation* is influenced by the Alpine climate; the *frequency of the pulse* is increased, and, in general, the higher the altitude reached the greater the increase. In this respect also an adaptation takes place, i. e., the pulse gradually returns to its normal rate, but the period required for such adaptation is longer than in the case of respiration. So far as the blood-pressure is concerned there is, according to Burckhardt's investigations, a slight increase. *Burckhardt* tested the blood-pressure of patients who came from Basle to Davos, the difference in the altitude amounting to 1350 metres. The increase in the pressure of the blood fluctuated between 6 and 64 mm. Hg.

In the pneumatic chamber, on the contrary, *Igersheimer* found that on reducing the air-pressure the pressure of the blood either remained unaltered or, in the greater number of cases, sank also. There were only two exceptions. The fall amounted generally to not more than 10 mm. Hg., at most to 20 mm. The fluctuations in the blood-pressure are in any case not of importance at altitudes which are resorted to for therapeutic purposes.

Burckhardt found that in slight cases of pulmonary disease the blood-pressure was the same as in healthy persons, whereas in advanced disease it was regularly decreased.

The mountain climate has, especially at first, an exciting influence on the healthy heart, and, by exercising the cardiac muscle, also a lasting tonic effect.

As early as 1877, *Paul Bert* (cf. Miesher) in his celebrated work: "Sur la pression barométrique", hazarded the conjecture that an increase in the number of blood corpuscles or in the quatity of hæmoglobin might play a part in the acclimatisation of men and animals to the thin air of high

altitudes. In 1882 Bert was able to announce to the Académie that various samples of animal blood sent him from an altitude of 3700 metres in Bolivia showed a quite unusual capacity for absorbing oxygen, and must accordingly contain more hæmoglobin than the blood of lowland animals.

In 1889, on the occasion of a journey in Morococha (Peru), at an elevation of 4392 metres, *Viault* was able to demonstrate an increase in the number of red corpuscles from 5 to $7\,^1/_2$ and 8 millions in his own blood and that of five other persons. Very high figures were also found among the mining population of these parts.

Egger made comparative investigations of the blood of rabbits at Basle (275 m.) and Arosa (1850 m.), and of the blood of healthy and diseased human beings at Arosa. He regularly found an increase in the number of the red cells, and of the hæmoglobin also, in almost the same proportion, and was therefore able to confirm the conclusions arrived at by Viault. Egger believes that there is an actual multiplication of red corpuscles, and not merely an inspissation of the plasma. In the same way may be explained the observations of *Mercier*, Arosa, who noticed the appearance of small blood corpuscles. Unfortunately the number of red corpuscles and the quantity of hæmoglobin is somewhat lessened on return to the lowlands, but remains greater than before residence on the mountains.

At the instigation of the Basle physiologist, *Miescher*, whose early death we deplore, the results arrived at by Egger were tested for various lesser altitudes by *J. Karcher*, *F. Suter*, and *E. Veillon;* and all these observers reported results agreeing with Egger's.

Miescher seeks to explain the increase in the corpuscles by the inability of the blood to saturate itself with oxygen on the mountains (owing to the diminished partial pressure of oxygen) to the same degree as in the lowlands. It consequently carries a diminished quantity of oxygen to the marrow and by its deficiency in oxygen stimulates the hæmatopoietic elements to increased activity. This continues until the increase in the number of cells has made good this deficiency, and until a sufficient quantity of oxygen is once more supplied to the marrow. With the return from the mountains to the plains this stimulus is withdrawn, and a diminution of the corpuscular elements and of the haemoglobin sets in.

Miescher says that by means of this peculiar exaggerated reaction of the blood-forming organs the lessened partial pressure of oxygen in the atmosphere gives rise to a heightened oxygen tension in the tissues, with a consequent increase of vital energy and capacity for resistance. Such a change for the better in tissue respiration is necessarily of favourable import, preparing the way for the action of the natural curative forces of the system, as well as for the varied local operation of the other climate influences of the high altitude.

The appearance of nucleated blood cells, as even by *Schaumann* and *Rosenqurst*, speaks in favour of the formation of new red blood corpuscles. Both investigators examined the blood of dogs which had been kept in rooms with rarefied air. They found that the increase in the number of red corpuscles was preceded by an initial decrease.

During the period of diminution following previous increase they saw numerous phantom blood cells in the microscopic preparation, which points to increased dis-

integration of red corpuscles, making it therefore probable that an absolute and not a relative multiplication takes place.

Many authorities have pronounced against such absolute increase: *Grawitz*, for example, whose explanation is, that, as a result of the dryness of the air, of the increased rate and depth of respiration, and of the consequently increased quantity of water given off by the body and especially by the blood, an inspissation of the latter takes place. Grawitz supports his opinion by experiments on animals in the pneumatic chamber. In consequence of the inspissation there must be an increase of dry residuum in the blood plasma, and the total quantity of blood must be reduced.

Bunge has attempted a similar explanation, assuming that under the influence of the mountain climate a constriction of the vascular system takes place and that serum is thereby pressed out of the blood vessels into the lymph space. The quantity of blood is thus reduced, the absolute number of blood corpuscles, however, remains the same, and so a relative increase of corpuscles and of hæmoglobin takes place.

Zuntz, on the other hand, believes that the increase in the number of blood corpuscles may be explained by the uneven distribution of the corpuscles in the various vessels, i. e., an increased accumulation of corpuscles in the capillaries of the skin as opposed to the larger vessels.

In order to refute all these opinions, *Jacquet* and *Suter* have determined the total amount of blood and hæmoglobin and the dry residuum in rabbits at Davos and control animals at Basle, and also calculated the number of corpuscles in the blood.

The results of these investigations confirm the well-known fact that on removal from a low-lying to a higher place the number of corpuscles in the blood increases.

The total quantity of hæmoglobin in the Davos animals was greater than that of the control animals at Basle, while the dry residuum at both places was about the same.

Egger also, who carried out investigations upon the dry residuum of the blood at Basle and Arosa, found that it remained unaltered.

The Jacquet-Sutter and Egger experiments lend weighty support to Miescher's theory of the formation of new blood corpuscles.

Jacquet then sought to determine what property of the mountain climate causes the increase in the corpuscles and of the hæmoglobin. After experiments with animals in the pneumatic chamber he came to the conclusion that rarefaction of the air was alone sufficient to bring about the changes which had been observed to take place in the blood.

That at Davos the great intensity of the sunlight is not the cause of the increase in the blood corpuscles, is shown by a research of *C. F. Meyer*. Meyer examined the blood of rabbits and rats which were kept at Davos, under the same conditions as to food, in light and darkened rooms.

The reaction took place more slowly in the animals kept in the dark room, but the result as to increase of blood corpuscles was in the end the same.

Abderhalden has since then made more exact investigations with animals kept for experimental purposes at Basle (275 m.) and St. Moritz (1771 m.). He comes to the conclusion that an increase in the number of corpuscles

and of the hæmoglobin takes place with equal rapidity on arrival at a higher-lying place, and that the increase is maintained during the whole of the time spent at such place. The reduction in the number of blood corpuscles and of the quantity of hæmoglobin takes place gradually on returning to the plains.

Abderhalden found the total quantity of hæmoglobin to be greater in the St. Moritz animals than in the control animals at Basle. On the other hand the total quantity of hæmoglobin on return to the lowlands remained uninfluenced by the diminution in the number of corpuscles and the corresponding reduction of the hæmoglobin content. The amount of blood in the St. Moritz animals was throughout less than that of the animals kept at Basle — contrary to the result of the Jacquet-Sutter research.

On the basis of the facts thus established, Abderhalden feels himself in a position to adhere to the theory set forth by Bunge, and to characterise the increase in the number of red corpuscles and in the hæmoglobin as essentially relative, and not absolute.

Other investigators have raised objections to Meischer's explanation of the increase of the number of red corpuscles. Gottstein, for example, thinks that the high number is arrived at by a defect in the Thoma-Zeiss hæmacytometer, the instrument generally used in the counting. In consequence of the diminished atmospheric pressure at high levels, the cover-slip does not come so close to the ruled slide, and the result of this is a greater depth of the cell. Meissen tried to avoid this fault by introducing a sideward slit in the glass rim surrounding the cell. A continual adjustment between the inside and outside air would thus make the chamber independent of atmospheric pressure. With Meissen's new slit-chamber Schröder found no in-

The "Züge" road

The Flüela Waterfall

crease in the red corpuscles at various heights above sea-level. Nor did Gottstein on counting a constant emulsion of yeast cells, though he did when using the old Thoma-Zeiss instrument.

At *Turban's* instigation, Sokolowski, Kündig and Karcher tested Schröder's results by the employment of the Zeiss instrument with thick and thin glass cover and Meisser's slit-chamber. With due allowance for faults, the results agreed with the figures previously arrived at by *Egger*, *Kündig*, and others.

Römisch and *Abderhalden* could also find no difference in the results obtained by the Thoma-Zeiss and Meisser's instruments: they confirmed with both instruments the increase in the number of blood corpuscles in the high mountains. By means of a constant emulsion of yeast cells at Davos and Basle, and again at Davos, C. F. Meyer was also able to prove that the Thoma-Zeiss hæmacytometer is independent of atmospheric pressure.

Opinions have up till now remained at variance as to whether the increase in the number of red corpuscles in the blood and in the amount of hæmoglobin is merely relative, or whether there is an absolute increase. In favour of this latter assumption there is the discovery made by Löwy and his companions, who in the course of their investigations on the high mountains found in mountain animals a marrow especially rich in blood; a circumstance which points to great activity on the part of this blood-forming substance. So much is certain, that the climate of high altitudes exerts a stimulating effect on the circulation and composition of the blood.

On the basis of his own experiments, and paying due regard to the results of other investigators, *Jaquet* comes to the conclusion that the increase in the number of red

corpuscles in the blood, and in the amount of hæmoglobin, is not a process due to any one cause, but is dependent on the co-operation of various causes. A new formation of blood is certainly involved; it sets in gradually, and does not explain the considerable increase frequently observed to take place immediately after arrival on the mountains. This initial excess of corpuscles is not an absolute one, but is only relative, and results from an alteration in the constitution of the blood in the various vascular areas. Finally, a very slight inspissation of the blood seems to contribute somewhat to the increase of the erythrocytes. The *principal reaction*, however, is the new formation of *red corpuscles*, which, as various experiments have proved, depends simply and solely on the diminution of pressure.

Finally, the experiments made by Bürker are of great importance in the question of blood-changes on the high mountains. He refuted by the most exact experiments (by direct measurement and by optical methods) the opinion put forth by Gottstein, that the Thoma-Zeiss hæmacytometer is affected by atmospheric pressure. Moreover, by determination of the amount of iron contained in the blood of animals experimented on at Tübingen and at Davos (Schatzalp), he comes to the conclusion that on the high mountains the content of iron in the blood first of all increases, then sinks again, and then at last definitely rises — as is known to happen in the case of the hæmoglobin. The fluctuating estimates with regard to the amount of hæmoglobin and the number of corpuscles contained in the blood may therefore be very well partly explained by the examinations having been made in various phases of the blood-curve. In accordance with the results arrived at by the majority of the investigators now quoted, we must unconditionally express the conviction that the blood

does specifically re-act to the influence of the climate of high altitudes, and that the increase in the number of blood corpuscles is an absolute and not merely a relative one.

The above-mentioned alteration in the blood can be shown to take place in healthy persons as well as in lung patients. Kündig made experiments in relation to this point at Dr. Turban's sanatorium. He ascertained first and foremost an increase in the red corpuscles and hæmoglobin of lung patients on the high mountains, and found, further, that the number of red corpuscles increases with the severity of the disease. Kündig rightly sought the cause of this greater increase in the diminished respiratory surface of the lung actually functional when the disease is more extensive. At a high altitude, in slight or less severe phthisis the increase of hæmoglobin is, roughly speaking, in the ratio of the number of corpuscles, but in really severe cases it is somewhat below it.

The effect of altitude on the metabolic processes as a whole may be characterised as stimulating. As a result of the increased need of oxygen, the exchange of gases in the lungs is greater, and the subjective demand for nourishment, the appetite, is also increased. It is the same with invalids as with healthy persons, except that with the former there is not a rapid acclimatisation; but the stimulation of the appetite is permanent. *Löwy* is of opinion that it is not the climate of high levels in itself which has a curative effect on the sluggishness of the digestion, but rather the abundant physical exercise which is generally associated with a stay on the mountains. As opposed to this, I would remark that it is precisely during the first few weeks, when our patients at Davos take little bodily exercise, that we are most often able to observe a stimulation of the appetite and an increase of weight.

Jaquet made an experiment on himself and *R. Stähelin* relative to metabolism, special weight being laid on equality of nourishment and of muscular exercise. The experiments were made at Basle (275 m.) and on the Chasseral (1600 m.), and showed that on the mountains the system retains considerable quantities of nitrogen, which in all probability is used in building up the elements of the tissues, including the blood corpuscles. There is therefore a putting on of flesh in the most literal sense of the word, such as it is impossible to bring about by artificial means.

In the case of persons in good health, the temperature of the body is not influenced by the climate of high regions. On the contrary, a constant body-heat is better assured than in the lowlands, in consequence of the greater ease with which heat is given off at an altitude.

We shall enquire later on how matters stand in the mountains with regard to increased body temperature, and especially with regard to fever in tuberculosis of the lungs.

Sleep is in some few cases disturbed, restless, and curtailed at high altitudes, especially at first; but during the day one has nevertheless the feeling of having had proper rest. The length of sleep is perhaps shorter, but this deficiency is made good by its soundness.

Lung patients whose disease is not too extensive, sleep as a rule better on the mountains than in the lowlands.

There are two components of the mountain air which have an effect on the outside *skin.* In the first place, the greater dryness is liable to chap sensitive skin, and also makes itself disagreeably evident in the drying up of the naso-pharyngeal mucous membrane. Secondly the

light-rays, the chemically active violet rays, have an intensely irritating effect on the skin, which shows itself in reddening and intensified pigmentation of the exposed parts. Veraguth has also noticed an increased turgescence of the skin on the covered parts of the body. This naturally contributes to that improvement of the circulation which we endeavour to bring about in our phthisical patients.

When the alterations in the various systems of the human body which are brought about by removal to higher-lying districts manifest themselves in a disagreeable way, we talk of difficulties of acclimatisation. These consist chiefly of accelerated pulse, palpitation of the heart, more rapid respiration, dyspnœa, slight fainting attacks, sleeplessness, restless, dream-disturbed sleep. The personality (individuality) plays a great part in relation to difficulties of acclimatisation. First and foremost it is very anæmic and nervous persons, those with so-called erethistic constitutions, who are troubled with these difficulties. These unpleasant symptoms disappear, according to Veraguth (quoted by Determann), in from 4 to 12, or, as in the majority of cases, from 6 to 8 days. It is quite possible, however, that they may persist so long as to make treatment on the mountains impossible. In order to avoid, or at least to minimise, difficulties of acclimatisation, it is best not to send weakly invalids direct to places more than 1000 metres above sea-level, but in the first instance to intermediate stations at altitudes of 400—1000 metres. In Switzerland suitable intermediate stations of this kind are: Weggis, Vitznau, and Gersau (444 m.), on the shores of the Lake of Lucerne; the health-resorts on the Lake of Geneva: Montreux, Territet (375 metres); and also Ragaz (521 m.), and Seewis, in the Prättigau (910 metres.).

Eichhorst says that difficulties of acclimatisation are

seldom observed at altitudes under 1000 metres, and in my opinion too much is made of such difficulties in relation to health-resorts 1500 metres high. At any rate, in the Basle Sanatorium at Davos, where 200 patients are admitted and discharged annually, I have only seen the aforementioned difficulties in three or four patients at the beginning of the cure, and then it was mostly in the case of women who are especially predisposed — of anæmic and erethistic constitution.

If we briefly summarise the effects of the mountain climate on the various functions of the healthy and diseased human body, we may say: The climate of high altitudes has a stimulating effect on the functions of the various systems of our body, and compels them to more energetic activity. This is a course of training whereby they acquire higher functional capacity and new vigour (Löwy).

The air of high altitudes takes a prominent place among physical remedies, and there are a number of morbid conditions, among which tuberculosis of the lungs undoubtedly figures in the first rank, for which it far excels in efficacy all other therapeutic measures whatsoever.

The eminent advantages which are inherent in the climate of high levels may be enjoyed by every lung patient who betakes himself to a mountain resort for the cure, so long as he lives a suitable life, and does not hermetically seal himself up in his room.

It now remains for us to speak of individual treatment. When we send an invalid to a mountain resort, we wish him to be placed in the midst of specially favourable climatic conditions, far from the anxieties and pressure of every-day life; we wish by means of proper hygienic and dietetic measures to endeavour to improve and

strengthen his whole constitution, and thereby cure the local disease also.

As already indicated, the open air cure for phthisis has been employed from of old. Its efficacy was in the main discovered by empirical means. Such was also the case at Davos. A. Spengler found, after 14 years' practice among the then 1600 inhabitants of the district, that nobody fell ill of tuberculosis, but that it was easily acquired by those who, for industrial ends, went to live in the lowlands. These latter, however, cured easily on returning home, provided the disease had not advanced into the hopeless final stage. After such experience it was natural to come to the conclusion that the Davos Valley must possess curative properties which would also benefit other sufferers from pulmonary tuberculosis.

Brehmer was the first to establish the open air treatment on a scientific basis, founded indeed on the relative immunity of climatically favourable, i. e., high-lying, places. He contended that immunity must be regarded as consequent upon the favourable influence of the air at these altitudes, whereby the favourable influence of the mountain air on the diseased body, and consequently on the lungs, was again demonstrated.

Good air in the open, says *Penzoldt*, ranks by the side of suitable nourishment as the most important factor in the treatment of tuberculosis of the lungs.

Brehmer, however, claims that, in addition to the open air cure, strict sanatorium treatment should form part of the rational treatment of pulmonary tuberculosis. For some decades we had become used to establishments of this kind in lower-lying health-resorts for the treatment of tuberculosis, and on the whole we had

thoroughly satisfactory results to report. And why should we not be able to still improve on these results by introducing sanatorium treatment on the high mountains, where even without such institutions good results had undoubtedly been obtained? — Thus we see at Davos, after the opening of the first sanatorium by Dr. Turban, in 1889, that gradually, even in spite of long continued opposition, one sanatorium after another was established, until we now find 11 private sanatoria, and 3 sanatoria belonging to communities, in existence, and another such institution in course of construction. Should we now send our patients to a sanatorium? or is the ordinary accommodation of the health-resort sufficient?

Egger says, in reference to sanatoria for lung patients: In the lowlands they are absolutely necessary; on the mountains sensible *(vernünftig)* patients can get well without sanatorium treatment. I should like to underline the word "sensible". A really sensible patient, who strictly follows his doctor's orders, would certainly do well; but a large number, especially among the young men, cannot be accused of too keen a comprehension of their condition or corresponding care in their way of life. Under the stimulus of our mountain air a patient whose disease is slight, or without fever though fairly severe, does not feel in the least ill, but is, on the contrary, most enterprising. He is all too prone in his walks or pastimes to overestimate his powers, and then has to pay the penalty of his rashness in an aggravation of his condition. Such unpleasant incidents are more easily avoided in a sanatorium. For the rest, in a place where so many sanatoria exist, there is an increasing tendency for patients living elsewhere to adopt a sanatorium routine; and the private hotels and boarding-houses to a large extent re-

semble the sanatoria in construction, provision of "*Liegehallen*", hygienic arrangements, heating, ventilation, etc.

The principles of a methodical treatment of lung patients involve the most extented open-air cure possible, combined with the rest cure ("lying out"), and also special feeding, together with a certain amount of exercise.

Brehmer, who, as already stated, must be regarded as the founder of the open air cure on the lines generally accepted, himself laid stress on the fact that the invalid must be afforded opportunity for resting, even during the shortest walks, chiefly by seats being placed within easy reach of the sanatorium. This principle of systematic resting, so that the patient should never really get tired, has been further methodically worked out by *Dettweiler*. He found that the seats put up by Brehmer around his establishment at Görbersdorf did not fully meet the needs of the invalids, and in 1868 he introduced the use of hammocks. But even this, though in itself a considerable step forward, suffered from the restriction that the cure could only be made in the hammock when the weather was fine, and at favourable seasons. It was not till the end of the seventh and beginning of the eighth decade of the past century that the lying-out cure on long chairs in the open air was introduced by Dettweiler. The result was so encouraging that the construction of special lying-out shelters *(Liegehallen)* was soon taken in hand. The new method of carrying out the cure was favourably received everywhere, and now the *Liegehallen* and *Liegestühle (chaise longue)* are met with in most sanatoria for lung patients. By this means the open air cure was made independent of weather and season. On the mountains, too, the open air cure could now be carried on, summer and winter alike, without any great difficulty. Penzoldt

says: Laying, as one rightly does, the greatest stress on open air treatment, it is evident that in a more favourable climate it can be carried out more agreeably, certainly with greater thoroughness, and therefore also to the greater advantage of the patient.

On the high mountains the large amount of sunshine enables one to be very much in the open air, and the greater dryness of the air makes the cooler temperatures in the morning and evening, and especially during *winter*, much less unpleasant. At Davos (which, quite wrongly, is now principally a winter resort) there is — to say nothing of sanatoria — not an hotel, a boarding house, hardly indeed a private house, which has not its south balconies, or *Liegehallen*, and *Liegestühle;* and this alone is a proof that the open-air cure is thoroughly carried out on the high mountains.

The patient must be gradually accustomed to the open air cure. For the first few days of the treatment only a few hours must be spent on the *Liegestuhl*, especially the sunny midday hours. Most patients, however, especially those without fever, very soon get used to the open air treatment; so that almost the whole day, with the exception of meal-times, can be spent out of doors — according to *Turban* an average of 9 hours in winter, and 10 or 11 in summer. We are no longer so anxious as *A. Spengler*, who limited his patients' time in the open air to the period between 10 o'clock in the morning and 3 in the afternoon (an hour before sunset). By this continual open air life (including sleeping with open windows) we aim at the strengthening and hardening of our patients; we do not anxiously protect them from every draught; we wish to free them from that everlasting constitutional dread of catching cold; we want to make them independent of the influ-

ences of the weather, — and in most cases we are successful. It is necessary, however, that the invalids when lying out on their chairs, especially in the evening, should be wrapped in woollen rugs, in winter preferably in fur sacks, so that there should be no feeling of chill.

But the *Liegekur* (rest cure) is not borne equally well by all patients. Here too it is necessary to individualise. For example, patients with much irritability of the upper air passages, as well as those with affection of the larynx, would do best not to continue the open air cure during the colder and more humid hours of the evening.

But we want to protect, as well as harden, our patients, and this is best done by means of suitable clothing, which must be specially and carefully chosen for the high mountain climate, and with a view to the often not inconsiderable fluctuations of temperature. Such clothing should be sufficiently warm, and yet sufficiently pervious for cutaneous evaporation and for ventilation. Warm underclothing is absolutely necessary in winter.

For the protection of the air passages, the nose itself is the best preservative. It is much to be recommended that the mouth be kept shut and that respiration should take place through the nose, especially in cold and windy weather.

Whenever a new method of treatment is introduced, there are sure to be enthusiastic individuals who will carry it to extremes. The rest cure, in its turn, has perhaps at times been immoderately employed, and has in consequence been brought into discredit *(Cf. J. Goldschmid* and *W. Freudental).* To persist in it for too great a length of time, lying out the whole day long, must undoubtedly relax the body, and make it incapable of the least exertion, instead of making it, as is our aim, strong and resistent.

We reach this latter end by alternating the rest cure with an appropriate amount of exercise.

H. Weber, for example, says: "Bodily exercise forms one of the most powerful and most important means of cure", and "I would not willingly treat a phthisical patient without the help of physical exercise." Quite in contradistinction to this, is *Penzoldt's* pronouncement: "I should not like to treat a phthisical patient without rest, and regard the exercise as exceptional." Penzoldt bases his position on the universal medical law that no inflamed organ should be subjected to abnormal movement. Every increase of bodily movements, e. g., mountain-climbing or the so-called breathing-exercises, inevitably occasions a dragging upon the diseased parts, and a stretching in their neighbourhood, and this with a diminished blood-supply. The rise of temperature following exercise in apyrexial cases is for Penzoldt a danger-signal of the first importance. (Cf. also *Ott*, *G. Schröder*, and *Th. Brühl.)* *A. Spengler* also says in his pamphlet about Davos that in the treatment of pulmonary tuberculosis rest and movement must be exactly proportioned; for on the whole a restful habit of life is much better than too much exercise.

The right point of view is probably to be found midway between Weber's and Penzoldt's. At the commencement of a cure on the high mountains we allow a patient who has no fever to walk for only a short time on the level, and we lengthen the duration of his rest cure in proportion. As strength increases, his time for walking will be gradually lengthened, gradients will be recommended, the time spent in resting will be shortened.

For five years past, half and whole day walks have been undertaken every summer by patients of the Basle

Sanatorium, under medical supervision, differences of altitude ranging from 500 to 800 metres being involved. I was never able to discover any evil effects of these excursions, but ascribe that principally to the careful selection of participants, to the continual medical supervision with regard to walking, and to the abundant intervals for rest. It is hardly necessary to add that only completely acclimatised patients who have no grave symptoms, can take part in such walks. — Determann raises the following objection to high-lying winter health-resorts: "Finally, the deep snow is a hindrance to comfortable open-air exercise in the case of the weak, and especially for those with a weak heart". — In a well conducted health-resort, e. g. Davos, the snow is rolled in, after every fall, with rollers drawn by horses, and when it has become sufficiently hard and has been worked down with a scraper, the invalid can walk on it as comfortably as upon a parquet floor. The objection that the patient is too easily tired by walking in deep snow does not therefore hold good.

Lung patients should not be permitted to take part in any such exercises as are really of the nature of sports, such as tobogganing, ski-ing, skating and other ice sports, and cycling; for passionate indulgence in such sports leads only too easily to excess.

The strengthening and hardening of the system brought about by the open air cure and moderate exercise, can be seconded by hydrotherapeutic treatment. Its intention is a stimulating and tonic action upon the functions of the skin, which are so notably affected in phthisis. For this purpose we have at our disposal: dry, wet, and alcoholic friction of the various parts, wet compresses, and the douche, all of which are best used in the morning.

Good and suitable nourishment is of great value in

the treatment of pulmonary tuberculosis. A good digestion is the best helpmate of diseased lungs.

As we have already remarked, the appetite generally increases on the high mountains, owing to the stimulating influence of the climate; and as, in addition to that, metabolism is more active than in the lowlands, it follows that more abundant nutrition must take place. Without advocating an actual food-cramming cure, a not exactly forced superalimentation is nevertheless in place. Most suitable of all is a well varied mixed diet, with plenty of milk and butter, and it has proved advisable to give five or six meals a day. Nearly all writers on the subject are agreed that milk is a particularly good and easily digested article of diet, and in many sanatoria it is given in quantities of from a litre to a litre and a half daily. The frequent dislike of milk can be overcome by adding brandy, salt, coffee, tea or cocoa, etc.

Igersheimer found that well nourished phthisical patients, even when severely ill, show almost normal blood-pressure, whereas badly nourished patients regularly show a diminished pressure. But with a permanently lowered blood-pressure, the circulation suffers, and with it the nutrition of the whole body. It is to be inferred, therefore, from this fact alone, that a well nourished condition is of value to the lung patient. Loss of appetite, often observed in phthisis, stomach complaints which require special treatment, dyspeptic troubles, diarrhæa and constipation, can of course be treated in exactly the same way as in the lowlands. Turban emphasises the fact that according to comparative experiences in the most varied climates, the high mountain climate considerably facilitates the nourishment of lung patients. Alcoholic drinks are as a rule not necessary for patients who have no fever; but

taken in moderate quantities may be allowed as often stimulating the appetite. Large doses of concentrated alcohol, such as were prescribed while the present hygienic-dietetic method of treatment was still in course of development, I regard as decidedly dangerous. In the case of feverish and pneumonic processes, brandy may stand us in good stead.

As examples of how the regular interchange of rest, exercise, and meals may be worked out, I quote the order of the day as adopted at two Davos sanatoria:

Division of the day at Dr. Turban's Sanatorium for a well acclimatised, slightly ill patient, summer and winter:

7	o'clock	get up
7.30	„	first breakfast
8	„	douche
8.15— 9.45	o'clock	uphill walk, with rest at intervals
9.45—10.30	„	rest cure
10.30—11	„	second breakfast
11 —12	„	level walk, with rest at intervals
12 —1	„	rest cure
1 —2	„	lunch
2 —2.30	„	standing and sitting in open air
2.30—4	„	rest cure
4 —4.30	„	afternoon refreshment
4.30—6	„	level walk, with rest at intervals
6 —7	„	rest cure
7 —7.45	„	dinner
8 —9.30	„	rest, milk at 9
10	„	bed

The patient is $10\,^1/_4$ hours in the open air, $3\,^1/_2$ hours walking, 1 hour sitting, $5\,^3/_4$ hours lying.

Order of the day at the Basle Sanatorium at Davos-Dorf:

Summer	Winter	
6.30	7	get up
7	7.30	first breakfast;

followed by douche and walk, as prescribed by doctor.

10	—10.30	o'clock	rest cure
10.30		„	second breakfast
11	—12	„	walk, as above
12	—1	„	rest cure
1		„	midday meal
2	—4	„	rest cure
4		„	afternoon refreshment
4.30	—6	„	walk
6	—7	„	rest cure
7		„	evening meal
8	—9	(or 9.30)	rest cure
10			lights out.

The patient is in the open air for $10\,^1/_2$ or 11 hours, of which $5\,^1/_2$ or 6 hours are spent lying out, and a maximum of $4\,^1/_2$ hours in walking.

It is evident from these two time-tables that a patient who so divides his day can hardly become lazy and enervated on account of the rest cure; for walks of altogether $3\,^1/_2$ to $4\,^1/_2$ hours' duration are quite respectable performances.

In the course of tuberculosis of the lungs various complications and symptoms may arise, which on the mountains behave somewhat differently than in the lowlands, and for that reason deserve our attention. Foremost among these is *fever*. By fever is meant a temperature which during repose (and as taken in the mouth) rises

The Davos Lake

In the Dischma Valley

Near Spinabad

frequently above 37.3° C. (Turban). According to other authors, such as Schröder, 37.2° C. (mouth measurement) is to be taken as the fever limit (under the armpits 37.5° C.; in the rectum 37° C.). For proper recognition of the type of fever it is necessary that the temperature should be taken regularly every two hours from 8 o'clock in the morning till 8 o'clock in the evening.

In tuberculosis of the lungs, fever may result from infection with tubercle bacilli alone: we have then the purely tubercular fever, such as occurs in ordinary miliary tuberculosis. Rise of temperature is more often caused by mixed infection with the bacteria of inflammation, suppuration or putrefaction.

The best treatment of the fever of tuberculous patients is rest in bed, strictly adhered to until the fever has completely disappeared, as is recommended by Turban. The open air cure should of course be interfered with as little as possible. The window of the patient's room must be left more or less open, according to the temperature, day and night. Those are the best arranged establishments in which the patient can be moved in his bed on to a veranda, and so be really all day long in the open air, with the necessary protection, of course, against sun and wind. There are authors, such as *Meissen*, who, when the fever is of long duration, allow the patient to get up at such times as it temporarily subsides, so that he may not become enervated by remaining so long in bed. With regard to this, my own experience has taught me to favour Turban's method. At the Basle Sanatorium we often tried Meissen's plan of allowing patients suffering from fever of long duration to get up at hours when they were without fever. For two or three days all went well, and then the fever would rise again, and

the patient was confined anew to his bed. We often observed that patients who at home in the lowlands, sometimes even in hospital, had lain for weeks in bed with fever, lost their fever in a few days after coming up into the mountains (from Basle to Davos). On the other hand, the number of those whose fever subsided only after they had been here some months, is by no means small. Turban publishes a number of such cases with the observations reduced to curves, and I could considerably enlarge that number from the history of cases we have had at the Basle Sanatorium. Statistics show that the high mountain climate has to a high degree the property of reducing fever.

Volland reports that in 62.8 % of the patients who came to him with fever, the fever disappeared; Turban observed this in 64.9 %; Wolff, at Reiboldsgrün, in 55.5 %; Schröder, Hohen-Honnef, 37.2 % (quoted by *Egger*).

Schröder puts it forward as telling against the better results claimed to be obtained on the high mountains, that in Turban's Sanatorium slighter cases are treated for a greater length of time than at Hohen-honnef; but it must be pointed out that at Hohen-honnef only 40.3 % of the total number of cases had fever when admitted, whereas at Davos the percentage at Turban's Sanatorium was 46.8 %.

By what agency fever is often more favourably influenced on the high mountains, remains for the present unexplained. We must content ourselves with the fact. Although on the mountains we often see the fever disappear of itself, it many a time happens that we do not reach our end without the use of antipyretic remedies, if only to help the patient now and again over the daily maximum, and to improve appetite and sleep. Of the old medicaments

I would mention the salicyl-arsenic pilules specified by *ten Kate Hoedemake*. Of the host of newer antipyretic remedies, *pyramidon* is the foremost amid those which have gained a footing among our medicines. The treatment of fever is dealt with more fully by *Turban* and *O. Wild*.

Of the good effect of alcohol, which in the experience of *Brehmer*, *Dettweiler*, and others, is taken in the form of wine or grog at the time the fever begins to rise, I have not been able to convince myself, as in fever cases alcohol produces a certain euphoria. The night sweats which are so trying in the lowlands, and especially so much dreaded by the general public, disappear on the mountains in the majority of cases without our intervention, as I have shown in another place*.

Hæmorrhages are not more frequent on the mountains than in the lowlands. Indeed, according to statistics collected by *Egger*, they are rather less frequent. The principal remedy when hæmorrhage has once set in, is, here as everywhere, rest in bed, and perhaps the employment of narcotics. One frequently sees good and quick results, if often of only a temporary nature, from the ligation of the limbs. Voigt has recently recommended a subcutaneous injection of adrenalin. Injection of from $^1/_2$ to 1 c. cm. of the 1 $^0/_{00}$ solution of adrenalin, as usually sold, is employed. An immediate unpleasant result for the patient is a short attack of palpitation, accompanied by anxiety, which seems to travel from the heart upwards. Objectively, the pulse during this time feels hard and powerful. Since Voigt's publication I have repeatedly employed these injections, and was able in every case to establish a positive effect.

* E. Nienhaus, Kampferölinjectionen bei Lungentuberkulose. Zeitschrift für Tuberkulose und Heilstättenwesen, Vol. V., Part 1, 1903.

Within half an hour or an hour after the injection, the sputa, which were at first of a fresh red, became brownish, and in favourable cases no fresh bleeding set in. Internal employment of adrenalin was entirely without effect.

With respect to *pleural* complications, Egger says: It may be deduced from a variety of experiences that non-purulent exudations which in the lowlands show no inclination to reabsorption, disappear on the mountains in a comparatively short time. Pleuritic thickenings also, when not too extensive, are stretched by the deepened respiration, the involuntary breathing exercise, caused by the altitude, so that an improvement of the affected parts takes place. The dyspnœa and the frequently accompanying palpitation also subside.

Carl Spengler (quoted by Egger) published a case of successful operation on pyopneumo-thorax, and L. Spengler 5 cases of healed tubercular pneumo-thorax. The method employed was puncture and slow emptying of the developing exudation at several sittings. With the disappearance of the exudation, the tubercle bacilli also disappeared from the sputum. At the time of publication the cure had held good, in four cases, for 2, $4\,^1/_2$, 5, and 7 years respectively. *E. Wölfflin* made a comparative study of the cases of surgical tuberculosis at the Samaden District Hospital (Engadine), and came to the conclusion that these diseases assumed the same forms in the mountains as in the lowlands; but the healing of the wounds, as well as convalescence, ran its course quicker and better than in the lowlands. Above all, chronic symptoms, tuberculosis of the bones and joints, of the urogenital system, and probably also lupus, are more favourably influenced by the mountain climate.

These good results open out a wide perspective (especially in the case of children) for the climatic treatment of surgical tuberculosis, which, indeed, is often associated with tuberculosis of the lungs. Surgical treatment is not, however, for this reason entirely avoided, but according to Wölfflin's experience is conducted in a more conservative manner than in the lowlands.

Another quite frequent complication of tuberculosis of the lungs, tubercular disease of the *larynx*, used to be considered, and to a large extent is still considered, though wrongfully, to be a contra-indication for mountain treatment. *Peters* pointed out that, simultaneously with the strengthening of the whole system, the laryngeal phthisis often heals with the cicatrisation of the lung disease. Any local treatment that may be necessary can be carried out at a mountain resort like Davos just as well as in the lowlands.

Derscheid (quoted by Egger) found that of L. Spengler's 252 laryngeal cases, 145 (i. e., more than 50 %) were cured, 12 had begun to heal, 32 had much improved, and in the case of 63 patients no further results could be attained, owing to other tubercular or general illness of too severe a nature. Turban in his statistics gives the permanent improvement in tuberculosis of the larynx as equivalent to 33.8 %. This clearly shows us that a large number of laryngeal patients may be successfully treated on the high mountains.

Tubercular diseases of the *intestine* and *peritoneum* are, according to *Egger*, not improved on the mountains. *Bernhard* is of the contrary opinion. Certainly, however, in well provided health-resorts and especially in a sanatorium, the same dietetic measures or surgical treatment

can be carried out as in the lowlands, and, at the very least, an equally good result is therefore to be expected.

Non-tubercular complications, such as anæmia or gastro-intestinal complaints, are often healed in the course of a "cure" on the high mountains, with the aid of special treatment. Disorders of the gastric functions are, in particular, often solely consequent upon fever, and improve when the fever disappears.

This is not the place to speak of the treatment of phthisis by drugs. Much good has undoubtedly been done with the endless number of remedies which have been recommended for the treatment of tuberculosis of the lungs, and especially with the preparations of creasote and its derivatives; and as an accessory to the high mountain cure a preparation of creasote may now and again be quite in place. During the last few years the so-called specific treatment by injection of Koch's tuberculin or of anti-tubercular serum has been gaining ground — to say nothing of Landerer's cinnamic-acid treatment. If the tuberculin treatment should stand the test (which is not yet absolutely certain) the ideal treatment of tuberculosis of the lungs would consist of sanatorium treatment on the high mountains, combined with tuberculin treatment.

Let us now pass on from discussing the treatment of phthisis on the high mountains, and endeavour to answer a few natural questions. First, *when* should we send our patients to the mountains? To this question there is only one answer, which is: "As soon as the diagnosis is made"; for the shorter the time the disease has been existent, i. e., the smaller its extent, so much the more certain will be the success of the cure at the high mountain resort. In this connection we must absolutely refuse to allow our-

selves to be influenced by the question of season. The widespread prejudice that invalids should only be sent to a mountain-resort like Davos in the winter is still prevalent. Consequently, it often happens that precious time is lost in the employment of all kinds of drugs, or in residence at a summer resort; the disease has time to spread; and not until there is a good thickness of snow on the ground is it deemed right to settle at a high Alpine health-resort. In the meantime fever has also probably set in, the appetite, too, has been lost, the patient is emaciated, and so the prospects of a successful outcome of the "cure" have become considerably smaller, if they have not disappeared altogether. Statistics like *Turban's* and those in the annual reports of the Basle Sanatorium, clearly show us that the slight cases, those in the first stage, offer a much greater probability of immediate success, as well as a better result in the long run, than cases in the 2nd. and 3rd. stages. Here, therefore, we see good reason for sending the patient to the mountains as soon as possible. With regard to the permanency of the cure, Turban saw it holding good after from one to four years in 97.5 % of patients in the 1st. stage, 54.6 % in the 2nd. stage, and 17.4 % in the 3rd. stage.

In the first publication concerning Davos, by Dr. Meyer-Ahrens, in the year 1862, the resort was recommended, on the basis of A. Spengler's experience, for both summer and winter residence. It was, however, many years before there were so many visitors staying here in winter as in summer. At any rate, A. Spengler mentions in 1869 that were only half as many visitors in winter as in summer: 100 as against 200.

The views of lowland doctors have gradually altered, and we now see that the majority of visitors do not arrive

until the winter, to disappear again in the spring; while comparatively few invalids stay here during the beautiful summer months, although the resort is then equally advantageous.

Why the tables have turned so emphatically in favour of winter cannot with certainty be said. It is nevertheless a fact proved by statistics that the cure is equally successful in summer as in winter.

Among the first 1010 cases treated at the Basle Sanatorium, Finkbeiner found 265 purely summer and 314 purely winter "cures". The results in these 579 cases were: —

	Cured	Consid. improved	Somewhat improved	Stationary	Worse	Died
Summer cures	27.5 %	38.8 %	23.7 %	5.3 %	3.4 %	1.1 %
Winter cures	21.9 %	39.5 %	26.1 %	4.1 %	7.3 %	0.9 %

It will be seen, therefore, that there was improvement in 90 % of the summer and 87.5 % of the winter cases. The two percentages are almost equal, and at any rate show us that the results in summer appear in a most favourable light beside those of winter. So much is certain, that extremely emaciated people, who suffer considerably from the low winter temperatures, do best to begin their "cure" in summer, in order that they may enter upon the winter well acclimatised. It is also much better for patients who are troubled with rheumatic affections to begin their treatment in the summer months.

The question of the greater or less efficacy of the high mountain cure during the different seasons, brings us naturally to another prejudice, directed against one period in particular, that of the snow-melting.

A large number of visitors are of the opinion, shared unfortunately by many medical men, that the period when

the snow is melting is an extremely dangerous one for lung patients to spend on the mountains, and that it is absolutely imperative that the "cure" should be brought to a conclusion before that time.

Now, it must be admitted that various discomforts do occur during the changeable weather of this transition period, especially when a high föhn wind is blowing. Walks, for example, must often for a little while be somewhat circumscribed, and it will also be understood that after the long winter "cure", carried out for the most part beneath a bright blue sky and in dry air, the invalid begins after a few bad rainy days to long for a complete change of surroundings and conditions. But the Davos doctors are unanimously agreed that the local lung trouble is never unfavourably influenced by this period.

Turban gives statistical proof of this fact. In his sanatorium a meteorological statistical journal, giving the total number of patients and also the number of those in bed, is entered up daily. A patient is kept in bed for the slightest feverish disturbance, and comparison of the sets of figures therefore affords a good idea of the morbidity at any given time. Now whereas in the years 1889—1896 13.5 % of the total number of patients were on an average kept in bed, in March and April of the forenamed years the percentage was only 11.7 %. If the melting of the snow at Davos exercised an injurious effect on tuberculosis of the lungs, the latter figure would undoubtedly be much higher, especially as it is the experience in all mid-European climates that it is precisely in these months that slight catarrh and relapse are especially liable to occur.

We have, therefore, shown that no season of the high alpine year has a specially injurious effect on phthisis,

and that the results are about equally good summer and winter; so that there is no reason to curtail the "cure" on account of change of season.

How long, generally speaking, should a successful high mountain "cure" be continued? I answer this question in the words of *Penzoldt*, who says: When a patient has found a mountain resort where he makes steady progress, generally quick at first and slower afterwards, he should if possible remain as long (even after the disappearance of all symptoms) as seems in general needful in accordance with experience for arriving at a cure which shall be of a more or less permanent nature. Disappearance of the symptoms of the disease must not be confounded with cure. Such treatment may last months, and even years. Thus we find a large number of business people, with pulmonary lesions of limited extent, who live in relatively good health at Davos, but who get worse if they stay for even a short time in the lowlands, and would almost certainly break down entirely if they settled there altogether.

Penzoldt says elsewhere that in the treatment of tuberculosis of the lungs the most important thing is that the patient should be sent away early, and for as long as possible. Much travelling about is objectionable. If, however, the high mountain climate does not suit a patient, if relapses in the state of the lungs continually occur, a change of residence should not be feared; but the physician must not yield too soon to the wishes of an impatient invalid who has only been in the place for a few weeks.

What should determine our judgment concerning any treatment or health-resort is, first and last, not the scientific argument, but the number of good results obtained.

It has often been asserted that the results attained

in lowland sanatoria are quite as good as those obtained on the high mountains. This view may be summed up in the postulate that it does not matter where, but only upon *how*, tuberculosis of the lungs is treated. For a long time all climatic influences were denied, especially by German authors. But after several years' experience it was found that the reports of the people's sanatoria in the lowlands did not publish such brilliant statistics of cures as had been anticipated. In January, 1903, J. Katz ventured to tell the Berlin Medical Society that the importance of climate had been much underestimated in connection with the sanatorium movement. He recommended German South-West Africa as especially favourable from a climatic point of view. At present, sanatoria are being erected at a great expense of German capital on the island of Madeira. The climatic factor in the treatment of phthisis is therefore again slowly receiving attention.

Let us now try to show, on a statistical basis, that the high mountain treatment of tuberculosis of the lungs is superior to sanatorium treatment in the lowlands. For determining the value of the results the immediate outcome of the "cure" is of less value than the permanency of the results as ascertained some years later.

According to a computation by Jessen, the permanent results as to recovery of capacity for work are as follows: —

German Sanatoria, after 4 years (Engelmanns Arbeiten des Kaiserl. Gesundheitsamtes)	20.1 %
Turban (Davos), 1—7 years	48.0 %
Basle Sanatorium (Davos), 4 years (Annual Report, 1901)	64,3 %

On the basis of the "Amtliche Nachrichten des Reichsversicherungsamtes" (Official Gazette of the Imperial In-

surance Department) and also the subsequent examination of patients by Professor Egger, of Basle, I undertook to formulate a comparison of the lasting results of the German sanatoria and of the Basle Sanatorium. I must say, by way of preface, that the subsequent examinations at Basle were made in 367 cases, whereas the German investigations comprised several thousand.

At the end of the year 1901 there were, out of the patients leaving in

	German sanatoria	Basle Sanatorium	
1897	27 %	58.16 %	fit for work (*arbeitsfähig*)
1898	34 %	59.05 %	"
1899	41 %	59.74 %	"
1900	50 %	73.07 %	"

The differences are so great that the imperfection which must result from comparing large with small numbers cannot here be of any great importance.

I must also especially emphasise the fact that the German *Volkssanatorien* are much more rigorous in the selection of their patients than is the case with us on the high mountains. This is a fact which is, indeed, well known to those experienced in the treatment of tuberculosis, and of which I was able to convince myself during a stay of several weeks in one of the German public sanatoria.

The figures arrived at speak so plainly in favour of the high mountain treatment that any further comment seems to me to be superfluous.

I therefore conclude my article with the following words of Liebermeister, an acknowledged master of phthiseology: "A patient may indeed make a good cure

at home; good results are also obtained here among ourselves (in the lowlands) in well conducted sanatoria; but on the mountains they are obtained oftener and easier. Those who have seen many patients who have come back from the German sanatoria and also many who have returned from the high mountains, will soon be convinced that cures, and especially permanent cures, are more often obtained on the mountains. And for the unfortunate patient only the best is good enough".

SUMMER ON THE HIGH MOUNTAINS.

BY DR. A. BRECKE.

At the end of winter begins the season of catarrhs. *Ruhemann* shows in his Table III. that is was during the first season of the year that by far the greater number of patients with acute affections of the respiratory organs were admitted to the Berlin hospitals during the period 1889—96. Similarly, a large increase in bronchial catarrh and affections of the upper air passages is shown during February or March in *Hessler's* Tables I. and II., which relate to illnesses among the soldiers of the Berlin garrison during three years. This coincides with Ruhemann's Tables M. and ff. When it is remembered how often these acute complaints are the occasion of the first manifestation of a hitherto latent tuberculosis of the lungs, or, in the absence of specific symptoms, of its detection in the course of medical examination, one would expect that a considerable number of such patients would come to Davos in the spring. The actual fact is the very opposite of this. In the spring the number of invalids at Davos decreases, not to increase again until winter approaches. Fewer applications also reach the German Sanatorium at Davos in summer than in winter, — though here the actual number of invalids in the institution undergoes no change. — Among those who fall ill in spring there will be many for whom another climate seems more favourable than that of the high mount-

ains; many for whom a longer or shorter stay at moderate altitudes is indicated, before coming on to Davos. But, on the other hand, patients for whom the mountain climate has been declared by the doctor to offer the greatest likelihood of a successful cure, put off the journey to Davos until the winter. This is partly because during the warm period of the year they are able to live, without any special inconvenience so far as their complaint is concerned, at many places in the lowlands or in a sub-alpine climate, and are there able to be much in the open air. There can be no objection to this if they go into some proper establishment; but every doctor of experience has met with examples enough which show how often the patient, especially if he be a young consumptive who has not had the training which is obtained in a sanatorium, only gets worse at the summer resort, on account of the irregularity of the walks and amusements in which he indulges when without due control. *Nothnagel* rightly says that "a person suffering from tuberculosis should never carry on the 'open air cure' just as he thinks well, no matter *where* he does it".

It not infrequently happens that when a patient is told in spring that he should go to an alpine resort, he does not immediately do so, but waits till the winter. Without doubt the chief reason for this is the common idea that invalids find the mountain climate unbearable in summer.

In Germany one often hears it said: "It is too hot and dusty at Davos in summer". This view is shared by a man like *Cornet:* wind, dust and but little shade are, according to him, the characteristics of Davos-Platz in summer. Is this so?

With respect to the meteorological conditions which

TABLE I. **TEMPER-**

Averages, 1891—1900

Height in m		April			May			June		
		Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.
278	**Basle**	6,9	— 2,8	22,0	13,0	2,0	29,6	17,3	6,4	29,8
477	**Zurich**	8,8	— 2,7	25,2	12,2	0,5	30,2	16,5	5,8	30,2
610	**Chur**	8,6	— 3,6	22,1	12,1	0,8	29,0	16,0	5,0	31,0
950	**Seewis**	6,6	— 6,0	20,0	10,1	— 0,1	25,3	14,2	4,2	28,8
1243	**Schuls**	5,6	— 7,7	20,9	9,5	—2,7	25,3	13,5	3,6	27,7
1560	**Davos**	2,2	—12,6	19,2	6,3	—3,9	24,4	10,3	0,6	27,2
1892	**Arosa**	1,1	—11,4	15,8	4,7	—5,7	19,6	9,0	—1,7	24,0

TABLE II. **TEMPER-**

Averages 1891—1900

Height in m		April			May			June		
		Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.
0	**Westerland**	6,9	— 4,1	20,0	10,4	—0,5	26,1	14,1	4,2	28,2
0,3	**St. Petersburg**	2,6	—11,7	20,1	10,4	— 5,8	26,6	14,7	0,6	28,3
2,0	**Swinemünde**	6,6	— 2,6	23,2	10,9	0,2	31,2	15,1	3,0	31,3
21	**Harnösand**	1,3	—15,0	18,0	6,7	—7,0	24,0	12,6	—2,0	36,5
37	**Berlin**	8,6	— 2,9	24,8	13,5	—0,5	35,5	17,5	6,4	33,7
112	**Breslau**	7,2	— 6,8	24,6	13,5	— 2,1	32,4	17,2	4,5	31,0
235	**Stuttgart**	9,9	— 3,0	24,8	13,4	0,8	31,8	17,6	6,0	32,2
425	**Badenweiler** 1893—1900	8,7	— 5,3	23,0	11,5	0,0	26,7	14,8	4,0	32,5
700	**Schreiberhau**	4,4	—14,0	21,5	9,2	—6,0	29,0	12,5	— 0,5	28,5
812	**Oberstdorf** 1891—1898	5,5	—10,1	23,2	9,2	—4,2	29,2	13,2	—1,1	30,0
915	**Inselsberg** 1891—1898	3,4	— 7,9	20,1	7,3	—5,4	28,0	11,2	0,0	26,1
1100	**Brocken** 1896—1900	0,1	—10,5	14,9	4,0	—7,0	19,4	9,3	—1,5	22,0
1560	**Davos**	2,2	—12,6	19,2	6,3	—3,9	24,4	10,3	0,6	27,2

concern us in this connection, it is, in the first place, an ascertained fact that the *temperature* diminishes on the mountains in proportion to elevation above sea-level, and that in summer the difference is greater than in winter (Hann). This is quite sufficiently shown in the foregoing tables, which give the averages for ten years (1891—1900)

ATURE (° C.)

and Maxima and Minima of these 10 years.

July			August			September			October			Averages April-Oct.
Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	
18,9	9,8	32,8	18,	8,2	33,2	14,9	3,8	30,8	9,6	—2,2	25,0	14,1
18,0	9,2	33,3	17,5	8,6	32,2	14,6	3,3	30,3	9,1	—1,4	27,4	13,8
17,5	7,2	33,4	16,9	7,0	34,5	14,2	5,4	28,1	9,5	—3,3	24,0	13,5
15,6	5,8	29,0	15,2	4,9	28,2	12,5	0,8	26,2	7,9	—3,2	22,2	11,7
15,4	4,3	29,6	14,2	1,9	29,5	11,5	1,5	27,7	6,5	— 7,	21,9	10,9
12,	1,0	27,9	11,5	0,8	27,8	8,6	—4,9	25,2	4,3	—9,0	20,0	7,9
11,	1,4	24,	10,8	0,0	25,0	8,6	—2,2	21,8	4,5	—8,2	18,4	7,1

ATURE (° C.)

and Maxima and Minima of these 10 years.

July			August			September			October			Averages	
Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	Mean	Minim.	Maxim.	April-Oct.	July-Aug.
15,9	8,0	29,9	15,9	7,3	28,0	13,6	1,3	23,8	9,3	— 1,6	19,1	12,3	15,9
17,8	4,5	28,7	15,7	2,6	30,8	10,0	—1,4	23,1	5,3	— 8,1	18,4	10,9	11,8
17,6	7,4	31,5	17,0	5,3	31,8	13,6	3,1	30,2	8,8	— 1,2	22,0	12,8	17,3
15,8	4,0	33,0	13,5	1,5	28,0	9,2	—2,0	24,0	4,2	—15,0	16,0	9,0	14,7
18,9	8,6	35,1	18,4	8,4	34,6	14,5	4,1	32,7	9,5	— 1,2	23,9	14,4	18,7
18,7	7,7	33,8	18,4	6,0	36,7	14,6	1,2	31,0	9,6	— 3,9	25,2	14,1	18,6
19,0	8,8	34,6	18,7	7,8	36,2	15,3	—0,8	31,6	9,8	— 3,0	25,8	14,8	18,9
17,8	6,0	33,5	17,2	6,5	33,0	14,5	3,0	29,5	9,4	— 2,4	23,2	13,4	17,5
14,5	0,1	30,0	15,7	0,9	32,6	11,0	3,6	29,0	7,0	— 9,6	28,0	10,6	15,1
15,0	2,7	32,0	14,0	-0,3	32,8	11,4	—1,7	27,4	6,2	—11,6	25,4	10,6	14,5
12,	2,8	27,5	12,4	3,5	30,2	9,5	0,0	26,8	4,7	— 5,4	22,6	8,6	12,3
10,	1,0	25,5	9,9	2,	25,0	7,2	—1,2	22,4	3,6	— 7,4	17,5	6,3	10,0
12,	1,0	27,9	11,5	0,8	27,8	8,6	—4,9	25,2	4,3	— 9,0	20,0	7,9	11,8

at seven places in Switzerland, varying in altitude from 278 to 1892 metres.

Table II. gives a comparison of summer temperatures at Davos with those of various German towns. The differences of situation with respect to distance from the sea and height above sea-level need no elucidation. St.

Petersburg and Harnösand are included because the annual means of the two places (2.6° and 2.8° C.) come nearest to that of Davos (2.6° C.). *(Hauri.)*

It will be observed that the monthly means at all places included in tables I. and II. are higher than at Davos, which will also be seen at once from the means for the periods April—October, July—August. Exceptions are Arosa, 330 metres higher than Davos, and the exposed and northerly Brocken, 1100 metres high. These are the only two places whose minima and maxima are colder than those of Davos. Lower minima are shown by the Inselberg (where the maxima are higher in most months) and the Schreiberhau. All the other places included in both tables have higher mean and extreme temperatures throughout. The mean summer temperature at Davos (average of the monthly means April—October = 7.9°) comes nearest to those of the Brocken (6.3), Arosa (7.1°) and Inselberg (8.6°). *In general, therefore, the temperature at Davos, as well as at Arosa, is low even in summer,* but shows within each month great differences between maximum and minimum.

Tables III. and IV. show daily changes of temperature during the warmest months, July and August, as observed at the German Sanatorium, Davos-Wolfgang, as well as the monthly means of the three daily observations during the whole of the summer of 1904. From these tables it will be seen that the differences mentioned at the end of the last paragraph are caused in the main by pronounced daily fluctuations. The air regularly becomes very much cooler after sunset, because — in consequence of the rarefaction of the air and the diminution of its humidity with altitude — the nocturnal radiation of warmth from the earth

is less hindered, and is greater than is possible in the denser atmosphere of lower-lying places (cf. *Hann* and *Loewy*). According to Hann, comparative measurements of the radiation of heat, made with Pouillet's actinometer at Brienz and on the summit of the Faulhorn (2110 metres), show that the radiation on the latter is 37% greater. — What makes the summer so enervating in the plains, and especially in towns, is, above all, the circumstance that the walls and streets which during the day are heated by the sun, do not become cool even during the night, and that therefore the temperature in one's room is often too high to permit of quiet and refreshing sleep. In the mountain districts cool nights are the rule, an advantage concerning the value of which no invalid or doctor can have any doubt. It is especially patients with fever and those subject to night sweats, who feel in the highest degree the beneficent and refreshing influence of the cool nights. *A. Moeller*, of Brussels, draws attention to this: Ce n'est qu'exceptionellement que le thermomètre s'élève à 25° ou delà; même alors la chaleur est supportable et ne dure que quelques heures. Les matinées et les soirées sont invariablement fraiches. On n'entend jamais dire que le temps soid lourd; les nuits sont toujours refraîchissantes".

The nocturnal cooling is at times so great that precipitation falls in the form of snow, to the damage of the flowers and the deciduous trees. In the daytime also the temperature occasionally falls considerably when the sky is covered. At the German Sanatorium the central heating has almost always to be kept going during the summer.

The maxima sometimes reached at Davos in the middle of the day do not invalidate the fact that owing to the low average temperatures the Davos climate is even in summer a cold one. *E. Ranke* also characterises it as a cold climate.

TABLE III. *Temperature (° C.) at Davos-Wolfgang 1904*

Month	7.30 a. m.	1.30 p. m.	9.30 p. m.	Monthly mean	Maximum absolute	Minimum absolute
April	0.8	6.5	1.6	2.8	15.7	—13.0
May	6.6	16.7	5.4	8.5	23.0	— 5.6
June	13.9	14.4	9.0	11.5	23.0	1.1
July	12.4	18.0	11.2	13.2	23.8	2.0
August	9.5	15.7	9.5	11.0	24.8	— 1.9
September	3.6	9.2	5.3	5.8	17.1	— 3.8
October	1.0	8.0	1.8	3.1	14.2	— 7.4

TABLE IV. *Temperature (° C.) at Davos-Wolfgang*

Day	July 1904 7.30 a. m.	1.30 p. m.	9.30 p. m.	Max. absolute	Min. absolute	August 1904 7.30 a. m.	1.30 p. m.	9.30 p. m.	Max. absolute	Min. absolute
1.	10.5	15.0	11.0	15.7	7.6	10.5	20.6	10.3	21.6	8.0
2.	11.8	16.8	10.5	16.1	9.7	13.1	16.2	10.6	17.2	8.1
3.	10.3	14.5	11.2	15.4	8.5	10.7	16.6	11.1	19.0	8.1
4.	11.1	15.7	9.0	16.3	5.4	13.2	21.2	13.6	21.4	6.9
5.	8.9	13.7	5.9	14.0	3.8	15.1	21.5	11.4	21.8	8.4
6.	10.4	11.6	7.1	13.0	2.0	11.6	20.6	12.8	21.2	6.9
7.	10.3	18.2	11.8	19.6	2.6	14.8	20.9	12.8	21.5	8.0
8.	13.2	21.2	14.6	22.0	4.1	14.0	21.9	12.3	21.9	9.7
9.	14.7	21.0	14.7	23.0	7.0	12.0	18.2	12.8	19.0	8.3
10.	16.3	21.7	14.7	22.5	8.2	13.0	19.3	10.4	19.3	10.3
11.	16.3	22.0	14.7	22.1	8.5	11.1	19.7	11.3	20.4	7.2
12.	15.1	14.5	12.0	17.5	11.0	10.4	14.8	10.6	16.1	8.3
13.	12.1	12.2	11.7	12.8	10.6	10.6	18.1	10.8	18.6	7.8
14.	13.0	14.8	11.8	16.5	9.8	11.3	19.8	11.2	19.8	7.0
15.	13.8	20.1	12.6	21.6	6.8	13.2	20.9	12.4	23.1	8.5
16.	14.7	20.5	12.3	21.6	7.0	11.2	18.4	12.6	18.6	10.4
17.	14.9	22.2	11.3	22.6	7.8	12.7	21.0	13.2	24.3	7.6
18.	12.0	16.0	10.6	20.0	7.4	10.2	12.0	8.8	15.7	10.0
19.	13.4	18.2	11.2	18.7	7.0	7.0	14.7	8.4	15.5	4.1
20.	12.9	19.2	11.5	21.0	5.3	9.2	15.8	11.1	16.2	4.2
21.	13.9	24.0	15.2	23.8	6.0	10.0	12.0	11.4	18.3	6.6
22.	15.4	19.6	10.6	19.6	9.8	8.9	9.4	6.3	11.5	7.0
23.	15.1	18.7	11.6	20.0	7.5	4.2	5.3	3.4	6.6	1.1
24.	13.2	18.0	9.6	18.8	9.8	5.0	7.5	2.4	10.0	2.7
25.	12.1	20.6	14.0	21.6	6.2	2.1	3.0	1.8	3.2	1.7
26.	9.3	12.0	9.8	14.3	9.0	1.8	5.4	1.0	7.0	1.2
27.	11.2	14.5	10.2	16.0	7.9	1.7	11.7	7.7	12.5	—1.9
28.	8.7	12.0	7.5	12.5	7.0	9.1	14.8	7.4	15.5	4.4
29.	7.8	13.1	9.8	15.2	5.4	4.8	17.3	7.9	17.3	2.8
30.	9.8	18.4	9.9	19.6	3.7	6.0	19.4	10.4	19.4	3.2
31.	13.2	19.3		21.0	6.0	8.3	9.9	8.2	10.5	6.1

He was able to show that the long-continued influence of a moderately cold climate brings about an *increase in the production of heat* amounting to 3.4% per degree Centigrade of the decrease in the atmospheric temperature, and there-

TABLE V. *Average Daily Duration of Sunshine in Hours. (Means of 1891—1900).*

	April	May	June	July	August	Sept.	Oct.	Total
St. Petersburg	6.3	8.3	9.8	8.6	6.9	4.0	2.1	46.0
Zurich	5.8	6.4	7.5	8.0	7.9	5.5	3.3	44.4
Berlin	5.5	7.2	8.2	6.9	7.6	4.7	3.3	43.3
Breslau	5.3	6.3	7.5	7.4	7.5	5.1	3.4	42.5
Davos	5.4	5.5	5.9	6.9	7.0	5.6	4.5	40.8
Basle	4.3	5.9	7.1	7.2	7.3	5.2	3.8	40.7
Arosa	5.3	4.8	5.1	6.3	6.9	5.5	4.6	38.4
Inselsberg	5.3	6.3	6.7	6.3	6.1	4.4	2.2	37.3
Stuttgart	4.5	5.3	6.4	6.4	6.4	4.3	3.1	36.4
Brocken	3.0	4.6	6.5	5.5	6.0	3.2	2.9	31 7

fore quite rightly attributes part of the therapeutic effect of residence at high altitudes to this increased metabolism, and adds: Residence at high altitudes obviates all detriment from the heat of the sun in summer.

How is it to be explained that with such temperatures the opinion is current that the high mountain summer is too hot? It will be seen from Table V. that the duration of sunshine at Davos, although considerable, and greater than that of the sub-alpine resorts for which observations were accessible, is surpassed by that of the North German towns, by Zurich and by St. Petersburg. It cannot therefore be on account of the mere amount of sunshine; but it may be that the intensity of solar radiation on the mountain has given rise to this idea of great heat.

Hann writes: "As with elevation above sea-level the strata of the atmosphere which absorb the sun's rays are less powerful, the absorption must be less, *i. e.*, the intensity of the solar radiation must increase. As, moreover, water-vapour absorbs the radiant heat of the sun to a greater extent than the dry air, and as it diminishes more rapidly than the barometric pressure, so the intensity of the radiation also increases more quickly than is to be inferred from the decrease of atmospheric pres-

sure alone." Absolute measurements of solar radiation, which were undertaken by *Violle* and *Margottet* in 1875, have, according to Hann, shown that its intensity on the summit of Mont Blanc (4810 m.) is 15 % greater than on the Bosson Glacier (1200 m.) and 26 % greater than at the level of Paris (60 m.). Such numerical statements, which enable the intensity of the sunshine in various places to be compared in an unexceptionable manner, are unfortunately very seldom made. Neither the Royal Meteorological Office at Berlin nor the Swiss Central Meteorological Office has any such observations at its disposal. The frequently-used black bulb vacuum thermometer shows, as Herr Prof. Kremser of Berlin has kindly informed me, very different results of unequal value, varying according to the size of the bulb and the way in which it is blackened. The Angström actinometer, a thoroughly accurate instrument, is still but little used, and its introduction at all high-mountain stations is to be recommended. I will nevertheless record the following maxima of solar radiation (° C.) observed at Davos-Platz in 1903:

April	May	June	July	August	September	October
60°	66°	58°	65°	64°	61°	56°

As is show by Table III (though it may not be superfluous to emphasise it here), the atmospheric temperature is considerably less than the heat produced by solar radiation, which latter is shown at its intensest by the black bulb, owing to the fact that this latter absorbs all the rays, The great difference between the sun and the shade temperatures is a peculiarity of high altitudes, conditioned by the powerful solar radiation, as is very well illustrated by *E. Frankland's* observations quoted by Hauri. (Temperatures recorded in the sun by means of black bulb thermometer in vacuo):

	Altitude in m	Thermometer [°C.] in Shadow	in Sun	Difference
Whitby	20	32.2	37.8	5.6
Pontresina	1800	26.5	44.0	17.5
Bernina H.	2330	19.1	46.4	27.3
Diavolezza	2980	6.0	59.5	53.5

It is well known that the radiation of the alpine sun is of considerable power even in winter. The following were the maxima (° C.) recorded at Davos-Platz in 1903:

January	February	March	November	December
44	48	56	47	49

— although nobody will assert that the high mountain winter is too hot.

The darker the object shone upon, the darker, for example, one's clothes are, the more does this remarkable power of the sun's rays make itself felt; and whoever has occasion to travel along the mountain roads has abundant opportunity of realising the truth of the fine description of a summer noontide on the Julier Pass given by C. F. Meyer at the beginning of his "Jürg Jenatsch". On these roads it is hot, and dusty too, after the weather has been dry for some little time — as those tourists know only too well who ride over the Flüela Pass and arrive at Süs sunburnt and covered in dust. And the post-road on which Davos is situated does not behave differently from other such roads, whether they lead over the Alps, through the Black Forest, or across the plains of Northern Germany. But, in the first place, the roads at Davos are watered frequently during the day, both by water-carts and from the hydrants placed at short intervals (the street-watering cost the Curverein about 5000 francs in 1903); so that the dust nuisance is experienced here only to a very small extent — certainly not more than at other health-

resorts known to me. For the rest, a main road in summer can never, anywhere, be regarded as a specially suitable haunt for lung patients; and there are in the immediate neighbourhood of Davos so many paths laid out through the woods that neither invalid nor doctor need ever be at a loss to find a suitable walk. A path on the eastern side of the Lake, between it and the steep, wooded slopes of the Seehorn, deserves special mention. It is not only shady and cool, but also, with its glimpses of the gleaming water through the firs and pines, offers so much variety that it would not be easy to find a more suitable or more beautiful walk.

But even on the hottest days and with the most powerful radiation, one hardly ever feels it sultry. That is to be explained, in the first place, by the statements already made as to the air temperature, which is high only in the middle of the day. Still more must we take into consideration the fact that *the amount of water-vapour contained in the air* diminishes rapidly as the altitude increases, and also more quickly than the atmospheric pressure (cf. *Loewy* and *Hann*). Hann quotes in proof of this the following figures, in which the saturation-point at sea-level is taken as unity:

Height above sea-level	Amount of water-vapour	Pressure
0	1.00	1.00
1000 metres	0.73	0.88
2000 „	0.49	0.78
3000 „	0.35	0.69
4000 „	0.24	0.61

At a height of 1000 m., therefore, the amount of water-vapour contained in the air is less than $^3/_4$, at 2000 m. scarcely half of that which it contains at sea-level. The same result is made evident by the low figures shown by

Davos in Summer

the observation of *absolute humidity*. The annual summary of observations made at the Meteorological Station at Davos-Platz shows the following averages for 1903:

April	May	June	July	August	September	October
4.12 mm	5.35 mm	6.92 mm	8.09 mm	7.92 mm	7.00 mm	4.66 mm

For comparison with these figures I give the means of five years (1896—1900) for Keitum auf Sylt, Berlin, and Schreiberhau (in the Riesengebirge), taken from a complication for which I am indebted to the Royal Prussian Meteorological Institute at Berlin: —

	April	May	June	July	August	Sept.	Oct.
Keitum	6.2	8.1	10.8	11.7	11.9	10.4	7.9
Berlin	5.9	7.5	9.4	10.8	10.5	9.1	7.1
Schreiberhau	5.2	7.1	8.9	10.1	9.7	8.1	6.2

Finally, and also as a result of the diminished atmospheric pressure, evaporation — with the same relative humidity, temperature, and velocity of wind — is greater than in the lowlands *(Hann)*. If we also take into consideration the *movement of the air* effected by the regular valley wind (to be mentioned later), it is quite clear that the amount of heat given off by evaporation on the high mountains must be considerably greater, even in summer, than on the plains, and that it is much more difficult for a stagnant accumulation of heat, with its injurious effects, to take place. Even when climbing a steep height in the afternoon of one of the hottest days, one does not experience that feeling of enervation which is general after a long summer walk in the lowlands and which is not seldom the precursor of sunstroke. Loewy calls attention to the fact that the heat of the body is not

nearly so much increased by walking on the mountains as by the same amount of exercise in the lowlands.

The powerful solar radiation of the Alpine summer, which was our starting-point, is, however, not only not injurious, but has a definite hygienic value. There is an intensification of the light-rays as well as of the heat-rays, especially of the chemically active, short-wave blue and violet rays, which are very extensively absorbed by the lowest, densest, and most watery strata of the atmosphere, and which accordingly assert themselves most in the light on the high mountains (Loewy). *Elster* and *Geitel* have found the proportion of ultra-violet rays to be as 38 to 72 at Wolfenbüttel (80 metres) as compared with the Kolm Saigrun (1600 metres), i. e., about half (Hann). To the same cause is to be referred the fact that on the mountains the skin tans more freely and that the photographic plate is also more powerfully influenced. It is not yet quite certain to what extent this radiation is responsible for the effect of the alpine sun on lung patients. But the magnificent successes which *Finssen* has achieved by means of the chemical rays of the sunlight and of the arc-light are well-known. At Samaden, Bernhard has merely exposed surgical diseases to the rays of the sun, and in this way has both healed facial lupus and considerably improved tuberculosis of the shoulder-joint, as he was able to demonstrate to the complete satisfaction of the Swiss Central Medical Association in September, 1904. *Sorgo* and *Kunwald* have achieved considerable success in a number of cases by the radiation of tuberculosis of the larynx, and I can confirm their statements by the favourable experiences we have had in several cases at the German Sanatorium at Davos. By intense light, and especially by alternation of the same with shade,

changes in the distribution of the blood-cells in the various parts of the vascular system are brought about through vaso-motor influence. Loewy made experiments with regard to this on Monte Rosa, and found it possible to produce at will alternate increase and decrease of the number of blood corpuscles to the extent of several millions, both in himself and in his fellow-workers, according as they remained for some length of time on the glacier or in the hut, in the darkness or in the bright light. Loewy adds: These effects must not be regarded as of little importance. The demands which are made on the action of the smooth muscles of the skin as a whole, constitute a kind of gymnastics which heightens their functional capacity, and increases their power to withstand the influences of climate, i. e., *hardens* them. The climate of high levels, especially that of the intermediate and higher geographical latitudes, brings about of itself that which in the lowlands we endeavour to effect by special means, notably by hydrotherapy. That the *metabolism* of the human body is made more active by light, has been proved by the investigations of *Moleschott, v. Voit* and *v. Platen;* and according to *Rieder* this is brought about principally by the influence of the light on the efferent nerve endings of the skin, whence the stimulation is transmitted in a reflex manner to the central nerve-system, and thence to those nerves which influence the catabolic processes in the muscles, etc. The acceleration of the metabolism seems to effect above all the absorption of oxygen and the excretion of carbonic acid, but not the total nitrogenous exchange. Especially in childhood the organism is sensitive to and dependent upon the action of light, and *Uffelmann* long since recommended sun baths for scrofula (Rieder). — It is, therefore, not the *psyche* alone

that is influenced by light, although this influence, too, is not to be underestimated. *Hiller* has very well represented its value, when dealing with the effect of light at sea.

All these observations make it probable that the greater activity of light contributes not a little toward the beneficial results which many consumptives experience in the Alpine climate, even if, in accordance with C. F. Meyer's experiments, it is not associated with the increase of the red blood-corpuscles and of the hæmoglobin. It should be especially noted that *Jaquet*, in agreement with *Mermod* and *Veraguth*, found an increase in the *absorption of oxygen and the excretion of carbonic acid* by the lungs at no greater an altitude than from 1000 to 1800 metres, while in Loewy's laboratory experiments with rarefied air and air containing but little oxygen, no alteration in the exchange of gases took place with a rarefaction of the air equivalent to the altitude mentioned. The aeronautic observations of Zuntz and v. Schrötter are in accord with Loewy's results. It must therefore be something other than the diminished atmospheric pressure and deficiency of oxygen which causes the increase in the absorption of oxygen and the excretion of carbonic acid in the Alps. That — in addition to the coldness of the climate (p. 256—7) — the intensity of the light plays a considerable part therein, is probable, because, as already mentioned, it has been proved that light produces an increase of metabolism.

On the other hand, light injures the *schizomycetes*, and among them those which produce disease; and here again, according to *Downes* and *Blunt*, the blue, violet, and ultraviolet rays are especially operative. *Robert Koch* reported, as early as 1890, at the 10th. International Medical Congress, that in a thin stratum of air tubercle bacilli were killed by an exposure to the rays of the sun lasting from a few

minutes to some hours. Numerous observations followed on the injurious influence of sunlight on the bacillus typhosus, streptococci, staphylococci, and other bacteria. *Ruhemann* * has been able to prove by careful study of an extensive clinical material that the number of patients admitted to the hospitals at Berlin and Magdeburg for acute illness of the respiratory organs and also for influenza, is always in inverse proportion to the duration of sunshine; that is to say, the more sunshine there is in a given month or year, the fewer cases of these illnesses occur during that period. Ruhemann (II, p. 120) is able to show the same for tuberculosis of the lungs, in connection with which he expressly says that this is not only so for the initial stages, but holds good also, in the main, for aggravations of the complaint, the onset of fever, caseous pneumonia, hæmoptysis, final phases of tuberculosis, etc.; that is, aggravations which to no small extent are caused by pathogenic bacteria taken up from outside the system, whose development is hindered by sunshine. "If therefore", concludes Ruhemann (II., p. 70), "the amount of sunshine, which we estimate by its duration, governs the morbidity of influenza and phthisis, it must be inferred that places where there is much sunshine are ceteris paribus more favourably situated with respect to the appearance and course of phthisis than places with less sunshine". It is hardly necessary to add that sunshine is to be estimated not only by its duration, but also by its intensity. Ruhemann himself (I., p. 103) evidently agrees with the view, quoted by him from *Kruse*, that the disinfecting power of light increases with its intensity.

We now pass on to consider the question of *wind*.

* I. "Ist Erkältung eine Krankheitsursache und inwiefern?" 1898.
II. "Aetiologie und Prophylaxe der Lungentuberkulose." 1900.

According to Cornet, it is especially windy at Davos-Platz in summer. The mountains which form the Davos Valley are from 2200 to 2600 metres high, — Davos itself being situated at an elevation of 1559 metres in a valley with a level bottom about a mile and a quarter broad. That such a situation must afford considerable protection from wind, is self-evident. The prevailing winds are subject to much obstruction and diversion in a valley which, like that of Davos, is surrounded by mountains. In correspondence with its direction from north-east to south-west, most winds blow within the valley from north-east or south-west. The force of the north-east wind is considerably lessened by the Schlappin chain, but most of the other winds are also felt less at Davos than in the lowlands or on unprotected mountain heights *(Hauri)*. As will be seen from Table VI. on p. 273, the northerly winds are much more frequent than any others *(Peters)*. The *föhn* must also be included among the prevailing winds. It is a warm, dry wind which comes down with great force from the alpine summits from the SE., S., or SW., its direction depending obviously on that of the valleys (Hann). Its characteristics in different districts and the various theories as to its origin cannot be dealt with here*. This wind is most frequent in winter, least frequent and least violent in summer. Hann gives 30 to 40 as the average annual number of days on which the föhn wind blows, and states that, on the basis of seven years' observations *Wettstein* worked out the mean number of föhn days in North Switzerland to be: in winter 9.1, in spring 17.3, in summer 4.3, in autumn 9.6, making a total of 40.9 days during the whole year. These totals invariably include periods of several

* But see the article in this volume on "The Davos Climate".

successive days, the föhn generally lasting several days (usually three) each time. On the first of these days the föhn is heralded by a striking clearness of the air and brilliant colouring of the landscape. The wind often begins to blow during the succeeding night, and on the following day it rages with great force, not continuously, but in gusts. On such days Davos is indeed windy. Many patients feel worse on these occasions than at ordinary times, in the same way as may be noticed during close, thundery weather in the lowlands. They feel more languid and less cheerful, and their temperature is more inclined to rise. It is to be mentioned as a good feature of the föhn that it contributes considerably to the melting of the snow, and breaks up the ice on the lake. It may therefore be regarded as a real, though rather wild, herald of the spring.

The regular valley wind is of the greatest importance. In every mountain-valley a wind blows in the daytime during sunny weather, and as a rule *up* the valley. The cause of this is explained by Hann*. In the Davos Valley, however — as in the Upper Engadine — this wind blows downwards.... In fine summer weather the valley wind may be regularly detected by its effect on the Davos Lake, which is about a quarter of a mile from Wolfgang. In the early morning the surrounding mountains are reflected sharply and clearly in the surface of the Lake; a few hours after sunrise the water begins to ripple; the rippling increases towards noon, is generally at its height between two and three o'clock, and diminishes again in the evening.

Table VI. summarises the variations in the direction and force of the wind as observed during the summer of

* See also the article in this volume on "The Davos Climate".

1904 at the meteorological station of the German Sanatorium. When it is borne in mind that the irregular gusts of the föhn, which often reach a considerable force, cannot be registered in these statistics, we have the explanation of the circumstance that the northerly winds greatly preponderate, and that the average strength of the wind only once (Sept., 1.30 p. m.) exceeded force 2 of Wild's Wind Scale (moderate wind, swaying smaller branches). The wind therefore — with the exception of the föhn — never makes itself unpleasantly felt, all the less so on account of the fact that invalids, who do the "cure" on balconies which face south, are not affected by the regular northerly current. On the other hand, the valley wind has an hygienic advantage which should by no means be underrated. This is (Loewy) the abundant renewal of the air which is continually taking place in the valley, and the consequent regulation of the temperature and humidity of the air, which cannot therefore reach excessively high and injurious degrees.

It will be seen from the foregoing that — the few föhn days apart — the summer at Davos is certainly not *unduly windy*, and that the regular light valley wind is not only not detrimental, but appears to be very conducive to the ventilation of the valley.

Finally, we must deal briefly with *rainfall*, because the opinion is not seldom to be met with that on the high mountains, as in mountainous regions generally, the summer is particularly rainy, and consequently uncomfortable and unbearable. The rainfall does as a matter of fact increase with increasing altitude, as is to be seen from the following figures given by Hann for the German central mountain region:

TABLE VI. *Direction of Wind at Davos-Wolfgang, Summer 1904.*

Month	Hours of observation	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Calm	Average force of wind	Ditto, monthly mean	Föhn.
April	7.30 a.m	5		1						11	1			1	1		6	4	0,6		
	1.30 p.m.	13		3						9	1	1		1			2		0,8	0,7	3 times
	9.30 p.m	14								11							1	1	0,7		
May	7.30 a.m	3		3						6	2	2		2	1	4		8	0,6		
	1.30 p.m.	6	3	5		3				3	1	4		1		3		1	1,1	0,7	twice
	9.30 p.m.	13	1	4		1		1		2		1				1	1	5	0,6		
June	7.30 a.m.	3	1	4						3	1	1		1		1		15	0,3		
	1.30 p.m.	9	4	10	1	1			1	1		1				2	1		1,5	1,2	
	9.30 p.m.	11		5		2						1		1		1	3	5	1,8		
July	7.30 a.m.	7		1						2		1						20	0,3		
	1.30 p.m.	9	7	8	1					1	1					2	1	1	1,3	0,9	once
	9.30 p.m.	11		6		2	1			3		2		1		1		3	1,1		
August	7.30 a.m.	3								4				4			1	18	0,2		
	1.30 p.m.	2	5	11	2	2				2		1		1		4	1		1,4	0,7	once
	9.30 p.m.	5	2	8						3						2		10	0,7		
Sept.	7.30 a.m.	4		3						4		1				2	2	14	0,5		
	1.30 p.m.	2	6	6		3				1		4				1			2,1	1,2	once
	9.30 p.m.	11	1	2		2				3		1				6		4	1,0		
October	7.30 a.m.	3		2	1	3				3		1				3		15	0,6		
	9.30 p.m.	5	2	14	1	3				2		3				1			2,0	1,3	
	1.30 p.m.	9	2	6	1	3		1		1		1				2		5	1,3		

Altitude above sea in metres	1-200	2-300	3-400	4-500	5-700	700-1000
Rainfall in cm.	58	65	70	78	85	100

But in the first place the amount of rain usual at a given altitude may be less in a different locality, and secondly the rainfall on the mountains is often influenced by the fact that most of the rain falls on the side which faces the usual rain-winds, while the other side is considerably dryer (cf. Hann). It may be owing to both these causes that the Davos Valley has a comparatively small rainfall.

TABLE VII. *Average Rainfall in Millimetres (means of 1891—1900).*

	April	May	June	July	August	Sept.	October	Total of Summer
Feldberg	205	180	205	215	143	190	267	1405
Oberstdorf	115	144	173	195	177	178	94	1176
Brocken	158	154	142	181	127	162	98	1022
Arosa	92	102	136	153	148	130	82	843
Seewis	110	94	104	127	128	119	73	755
Inselsberg	66	74	114	135	135	104	117	745
Schreiberhau	68	126	112	132	101	90	91	720
Zurich	98	96	99	112	97	110	100	712
Badenweiler	85	99	87	114	91	76	85	637
Davos	58	58	104	128	119	98	54	619
Stuttgart	69	75	97	95	77	62	83	558
Basel	70	56	83	92	76	80	81	538
Chur	56	16	86	101	97	85	58	500
Sylt	38	47	43	66	78	78	109	459
Schuls	41	51	61	85	81	72	61	452
St. Petersburg	26	37	75	64	80	67	52	401
Breslau	34	72	59	96	51	37	40	389
Swinemünde	36	46	47	70	66	50	62	377
Berlin	34	53	62	83	46	50	40	368
Harnösand	24	42	42	56	78	75	77	352

In Table VII., which compares the rainfall at places of various altitudes, Davos comes exactly in the middle. Of the places on the mountains, Schuls, in the Lower

Engadine, which is well known for its dry climate, is the only one with a smaller rainfall than that of Davos. Hauri gives the following figures as the means of five years' observations (1885—89).

Davos-Platz 1560 m	809 mm	Rigi-Kulm 1790 m	1640 mm
Sils-Maria 1810 m	927 mm	Engelberg 1021 m	1831 mm
Schuls 1243 m	617 mm	St.Bernhard2478 m	1368 mm
Zurich 460 m	1265 mm	Lugano 275 m	2031 mm
Basle 278 m	651 mm	Lausanne 556 m	1089 mm

This clearly shows the relatively small rainfall of the valleys situated in the inner portion of the Rhaetian Highlands. Hauri directs particular attention to the contrast with the Rigi-Kulm and Lugano, stations on the northern and southern frontiers of the Alps. Thunderstorms are not frequent; but when they break over the valley they often last a long time.

This is perhaps a fitting place to insert a few remarks concerning the first and last of the months which have been under our consideration — April and October. In the latter of these months the rainfall is generally at its lowest, whereby the reduction of the possible duration of sunshine conditioned by the decreasing length of the days is in part counterbalanced. According to the summary published in 1903 by the Davos Meteorological Office, the number of bright days (those with 75 to 100% of the maximum possible duration of sunshine) in the month of October (mean of the years 1886—1900) is 14; i. e., more than in any other month; and of the places included in Table V. (p. 261), Arosa is the only one which shows more sunshine than Davos during this month. The temperature is low, at night often sinking considerably below freezing-point, whereas in the middle of the day it is still gener-

ally warm. The minimum temperature at Davos-Platz during the years 1891—1900 was —9.0 ⁰ C., the maximum 20 ⁰, the greatest intensity of the sunshine during the same ten years being 51⁰. The small amount of downfall often comes in the form of snow. The absolute humidity is small; and this holds good to a rather less degree for September. On account of the stability of the weather in these two months, they are well known to be specially favourable for mountaineering. The fine weather season in the high mountains lasts on, therefore, until the beginning of November; so that September and October may be considered as belonging to the summer.

The *snow-melting* period, which generally begins about the end of March and lasts the greater part of April, is not distinguished by any great amount of rain or snowfall, and cannot therefore have got its bad reputation on that account. Neither can it be for lack of sunshine — as is shown by the figures on page 261. Nor is the average relative humidity any higher. — In the first place, however, the melting snow (which on many roads and paths outside the resort makes walking rather difficult, and brings grey tones into the hitherto gleaming white landscape) makes the high-mountain valley seem no longer so absolutely pure and unexceptionable as in winter. Above all, one notices the frequent *changes in the weather.* After some days of bright sunshine have melted the snow from off the slopes and brought out the crocus and gentian, fresh snow will fall and cover up all the splendour of spring, and then the new snow must turn into water in order to be got rid of. For sensitive human beings these changes in the weather are from the point of view of health no matter of indifference; they require that care should be taken. They are, however, not a peculiarity of the high mountains,

but take place all over Central Europe during this period of transition. The dangers arising from this cause are greater in the lowlands, on account of the spring gales, which are accompanied with a degree of humidity in comparison with which that of the föhn days in our high valley is scarcely worth consideration.

Although the summer climate of the high mountains falls short of that of winter in so far as it lacks a permanent covering of snow, it possesses, on the other hand, some advantages peculiar to itself, which should by no means be underrated.

The winter cold, which intensifies the other properties of the mountain air, influences first and foremost the skin and respiratory organs, and demands considerable functional activity on the part of the circulatory system in order to bring about an adjustment. This makes acclimatisation difficult for sensitive and weak persons, such as are anæmic, or have defective heart-action; and female patients so troubled seem to find it much easier to adapt themselves to the climate in summer. *Turban* has pointed out that patients who feel the cold very much, and those troubled with much sensitiveness of the upper air-passages, feel better at Davos in summer than in winter. This is often the case when there is a tendency to bronchitis and pleurisy. There are certain patients who in spite of the greatest precaution always suffer from these complaints in winter, and whose improvement is thereby retarded; whereas in summer their recovery is undisturbed by any such difficulties. Many who go through the treatment with good results in summer prove to have insufficient power of resistance to enable them to stand the winter on the high mountains. In many cases, therefore, one can count on favourable results with greater certainly in summer

than in winter. Above all, the greater ease with which acclimatisation takes place in summer makes it important that the lung patient, especially if he be sensitive, should, whenever possible, come to Davos during the warmer season of the year, and not suddenly exchange the mild lowland winter for the cold of the high mountains. — Patients with anæmia or weak heart are often able to get accustomed to the Alpine climate by first of all staying in some institution at a medium elevation, and not settling down on the high mountains until they have lived for a time without discomfort and with good results at such medium altitude. I have seen the good effect of such gradual ascent, e. g. by way of St. Blasien to Davos. Arosa or Leysin. Expedient though such intermediate stations occasionally are, the drawbacks inseparable from a journey are nevertheless a disturbing influence in the midst of the cure. The fact that the summer on the mountains is comparatively mild, and, as it were, a medium between the mountain winter and the summer of moderate altitudes, makes a stay at the latter elevation superfluous, and the patient can go direct to the high mountains.

A further advantage of the summer is the *greater freedom of movement* for such patients as are able to take advantage of it. At the commencement of the treatment, and especially when he first comes up to the high mountains, every lung patient is to be strictly regarded as a invalid. A patient who on the first two days after his arrival feels quite well, or even, in consequence of the stimulating effect of climate and surroundings, unusually well, will on the third and fourth day not infrequently suffer from such troubles as palpitation of the heart and shortness of breath: a fact which sufficiently explains the principle that, even when there is no fever, every patient should rest in

bed for a period of not less than eight days. After the lapse of some months, however, patients whose complaint has taken a favourable course, with or without the employment of tuberculin, are oftentimes to be treated less as invalids than as convalescents; i. e., by exercise of the muscles, including that of the heart, they are to be accustomed again to the fuller use of their bodies. For the more capable a man is physically when he returns to everyday life, the better able will he be to meet the demands it will make upon him, the less easily will he be exhausted and weakened, and the more, therefore, will he be protected against relapse. Even for the simplest forms of physical exercise, walking and climbing, the unobstructed paths of summer afford much greater and — a point which is not to be underrated — far more *varied* opportunity for walks, than the few roads and paths which are available while the snow is on the ground. When the days are long and warm, more ambitious outings may be arranged — always provided that the patients are carefully chosen. In addition to this, the abundant Alpine flora affords to many persons a long-wished-for opportunity for busying themselves with botany. — As exercise for the limbs and trunk, which, if only with a view to obtaining a posture of the body conducive to good respiration, is not to be neglected, gardening seems to me to be better and more effectual than anything else. It is only possible in summer. Snow work cannot be carried on with the same regularity, is liable to become a strain, is more monotonous and less satisfactory; for one's work may be buried under fresh snow the very next night, whereas the gardener can see the result of his labours growing and flourishing from day to day. — Cautious rowing in a light boat is also worth mentioning. It has the advantage that the lower part of the body can remain at

rest. In many cases it seems to be more advantageous than walking.

If we summarise the above-mentioned distinguishing features of the Alpine climate in summer, as observed in the Davos Valley, we find, in addition to the lower atmospheric pressure:

moderately warm temperature during the daytime, with a maximum of 27.9° C. (1891—1900),

considerable daily fluctuations, with noteworthy fall of temperature at night;

much sunshine, with powerful radiation;

small vapour-pressure;

regular though gentle local winds; general air-currents but little felt;

small rainfall.

Enough has already been said as to the modus operandi of these various forces to show that a climate where they are present is eminently suitable for those cases of pulmonary disease in which *treatment* at a high altitude comes up for consideration. *Nothangel* accordingly emphasises the fact that the "cure" can be carried on throughout the year; *Eichenhorst* mentions Davos and Arosa among the summer health-resorts; *Turban*, *Nienhaus* and *Römisch* have observed no essential difference in the results of the treatment in summer and in winter at either place, and my own more recent experience fully confirms this. It is as a rule not right that the patient should let the summer pass by, and only go to a mountain resort when the winter comes on. Just as little does the climate require that the duration of the "cure" should be regulated by the time of year, and that the high levels should be forsaken because the winter has

come to an end. That, in particular, the season of the melting of the snow does not possess the dangerous qualities ascribed to it, is clear from the facts given on p. 276. Turban has shown that it has certainly exercised no detrimental influence on his patients.

As a rule, the patient who at the end of the winter is still in need of treatment, does best to spend the spring also at Davos, amid the conditions in which his state of health has improved, and amid which he has become accustomed to live a healthy life, — instead of exposing himself, by a journey to, and life in, an unfamiliar place, to some illness of the upper air-passages, which may disadvantageously influence his tuberculosis, and may not be got rid of for weeks and months. When the snowy Alpine winter has come to an end, the longing for the lowland spring is easily understood; but it should be repressed in favour of the uninterrupted progress of convalescence, or — when this really seems to be impossible — its satisfaction should be postponed until the transitional period is quite at an end — about the end of May.

The case is rather different with those who have got well during the winter and who for the moment are no longer in need of treatment. It is frequently not necessary that they should remain on the mountains — still for the most part deep in snow — while the meadows below are growing green and the cherry-trees are covering themselves with bloom. There can be no objection to their returning to their homes or paying a visit to one of the intermediate stations where there is no longer any snow. Among such places, Seewis, Badenweiler and Baden-Baden — according to the season — are very suitable.

The earlier the tuberculous patient comes under

treatment, the greater the probability of a successful issue. Taking Turban's 408 cases, of the 11 patients who came to his sanatorium within the first month after the disease was known to exist in them, 72.7 % achieved a lasting result; of the 103 who were admitted within the first 6 months, 67 %; of those who came after having been ill for more than 6 months, 40.2 %. Of the 447 patients whom I discharged from the Grabowsee Sanatorium in the year 1899—1900, there were:

	Cured	Improved. Fit for work	Improved. Partly fit for work	No Improvement
163 of stage I	13=8.0%	128=78.6%	15=9.2%	7=4.3%
237 „ „ II	6=2.5%	99=41.8%	102=43 %	30=12.7%
47 „ „ III	0	0	19=40.4%	28=59.6%

From these figures — and in all sanatorium reports similar ones may be found — it will be seen how necessary it is for the patient to go as soon as possible to the place at which he desires to seek a cure — i. e., as soon as his complaint is diagnosed and his state of health will permit him to travel. All delay involves a danger of extension of the disease, which is then more serious and less amenable to treatment. Most cases that must be regarded as incurable might have been saved if they had come under treatment at the right time.

These facts are already well known. I venture to recall them strictly in connection with the information set forth in the preceding pages, in which I have tried to prove that the fear of the Alpine summer is unfounded. The combined premises lead to the conclusion that cases of pulmonary disease apparently suited for treatment in the high Alps should, in the absence of special indications for preliminary residence at an intermediate altitude, go there as soon as possible, absolutely regardless of the time of year.

THE FEAR OF INFECTION AT DAVOS

BY DR. F. JESSEN.

Again and again the doctor makes the discovery that lung patients visit various health-resorts, one after another, without finding the desired recovery, until finally they try Davos as a "last resort". Being undertaken too late, this also is now and again unsuccessful.

Not less frequently does it happen that patients who wish to come to Davos are dissuaded from doing so, even by doctors, as long as they are "prophylactics"; because the opinion prevails both among medical men and the general public that those who have a predisposition to tuberculosis are likely to become infected with the disease if they stay at Davos.

In the same way there prevails a widespread fear of sending children to Davos who are suffering from "scrofula" and similar complaints (often only masked forms of tuberculosis), although no better climate can be found for precisely such cases. But parents call to mind the greater predisposition of these children to tuberculosis; they do not realise that the already existing indisposition is perhaps a symptom of masked tuberculosis, and they wish above all to protect the little patients from tubercular infection. So away with them anywhere and everywhere — so long as it is not to Davos.

Another group of patients who would derive the greatest possible benefit from treatment at Davos is that of sufferers from neurasthenia and other neurotic complaints. But it is just these persons, already overcareful of themselves, who anxiously avoid a place so "plague-stricken with tuberculosis" as Davos. They hunt out other places on the mountains, which, neither as to climate, scenery, nor even sanitary arrangements, can compare with Davos.

Akin to these are sufferers from diabetes and anæmia, and those on leave from the tropics, all of whom, on account of the susceptibility of these conditions to tuberculosis, anxiously avoid Davos, although it is precisely at Davos that they might find, in the bracing effect of the altitude and sunshine (without the excitement produced by too great elevation), combined with the wonderfully reposeful effect of the Davos woods and meadows, that complete improvement which elsewhere they so often seek in vain.

If we ask what it is that hinders doctors from sending such patients to Davos, and often, indeed, makes the patients themselves decide not to come, the question admits of only two answers.

There is first of all the ominous sound which the word Davos has in the ears of so many to whom the place is personally unknown. It evokes the impression that when one is sent to Davos he must be a lost man. Many imagine Davos to be a place filled with coughing, spitting, emaciated human beings. And yet it is certain that in no other health-resort that is at all frequented by sufferers from chest complaints, is one so little under the impression of being in the midst of lung patients as at Davos. Here, in fact, we see red-cheeked, sun-burnt

faces in the streets, and find the tone of an ordinary pleasure-resort hotel prevailing at the sanatorium dinner-table.

But the second reason why so many people, doctors and others, avoid Davos, is the more important of the two: it is the *fear of infection.*

Unfortunately, a considerable portion of mankind has lately fallen a prey to a species of bacillus-scare that must itself be characterised as a disease in our social life. We owe a debt of gratitude to bacteriology for the improvements which it has wrought in hygienic conditions; we cannot but acknowledge that the press has done a certain amount of service by contributing to the spread of hygienic views; but we must make a most determined stand against the more or less misguided generalisation of bacteriological and hygienic principles. Generally speaking, there can be no doubt that *Fraenkel* (Badenweiler) is right when, in a lecture on the fear of infection in tuberculosis, he says that doctors often enough see how the most sacred obligations are threatened by the scare of infection and by the brutal egoism which follows in its train. This dread of being infected with tuberculosis will of course be found in greater measure when a place like Davos is in question — a place in which more than 20,000 invalids, in part tubercular, come together annually.

With regard to the danger to which, in general, the inmates and surroundings of sanatoria and resorts for lung patients are alleged to be exposed, it can be seen from a recently published compilation by *v. Lindheim* ("Die Gefahrlosigkeit der Kurorte und Lungenheilstätten in Bezug auf die Infektion der Bevölkerung, in saluti aegrorum, Leipzig and Vienna, Franz Deuticke) that such

danger does not exist. Von Lindheim brings forward statistics and reports from Austrian health-resorts such as Kierling, Luhaschowitz, Obermais, Meran, Arco, Gries, Abbazia; from Germany, relating to Reichenhall, Görbersdorf, Reinerz, Ems and Soden; from Davos; from the health-resorts of the Riviera: Bordighera, San Remo, Nice, Ospedaletti, Nervi, and Mentone. *These reports establish the fact that tuberculosis has not increased among the native population. Indeed, in consequence of the better nourishment of the population since the rise of the health-resorts, and the preventive measures taken, it has in many instances decreased.*

Now, it is because we are so fully persuaded that a timely and sufficiently long residence at Davos is, in consequence of the special properties of this incomparable resort, the best weapon against tuberculosis, and also that it is capable of conferring the much desired recovery upon many other sufferers, especially the nervous and anæmic, that we have undertaken to submit the question of the possibility of infection at Davos to a most thorough examination.

Let us first of all enquire what is done at Davos to stop the sources of possible tubercular infection.

In considering such a question it must not be forgotten that two factors are constantly involved: 1) the entrance of disease germs, and 2) the existence of a favourable soil for them, the "predisposition" of the organism attacked. Now, there is hardly any other place so adapted by the nature of its climate, its sunshine, and its combination of stimulating and sedative qualities, to remove quickly any existing constitutional weakness, as is Davos.

That disposes of one factor. The *predisposition* to

the disease *disappears*. In a few weeks the whole constitution is actively transformed and infused with new life.

This strengthening of the constitution affords, indeed, an explanation of the fact that indigenous tuberculosis was practically unknown at Davos, and that imported complaints of a tubercular nature were cured.

And now what is done to exclude the first factor which so disquiets the minds of those who are not acquainted with the circumstances? What steps are taken at Davos to prevent the tubercle bacilli from entering the systems of such visitors as have not yet been attacked by them?

Of the ways in which the bacilli may get into the body, there are two which call for special notice. One of these is the inspiration of dust containing dried microorganisms (Cornet's method); the other is infection by the spraying from the mouth of droplets containing bacilli, while speaking or coughing (Flügge's method). We have further to consider the possibility of infection by food, such as meat and milk.

The germs of tuberculosis can only be dried and inspired with the dust after they have been cast off from the body of a person suffering from tuberculosis into the outer world, in some tubercular excretion, first and foremost the expectoration. Cornet's preventive method is therefore directed above all, and almost exclusively, against the sputum of those suffering from tuberculosis. Now, at Davos it is not only forbidden to spit anywhere except into spittoons and pocket-flasks, but there is even a law by which all who spit on the ground in the streets and other public places are threatened with a *fine*. Furthermore, in the snow which covers the ground at Davos uninterruptedly for five or six months, nature pro-

vides a wonderfully effective protection against the spread of disease by dust. In the summer months there is, even apart from any artificial preventive means, less dust at Davos than, for example, in the Engadine; and the most extensive street-watering arrangements are made for reducing the dust (which, moreover, comes exclusively from the roads) to the least possible amount.

Should there, however, be deposits of bacilli in the rooms and on the household furniture and utensils, they are rendered innocuous by means of legally prescribed and enforced *disinfection.* This is carried out not only when a patient leaves Davos, but even every time he exchanges one room for another.

In two model laundries the patients' linen is disinfected before being washed.

Then it should not be forgotten that the discipline observed in the sanatoria has brought about a general training in cleanliness, in carefulness with the sputum, and in coughing, so that, without exaggeration, scarcely a place could be found in which so little coughing is to be heard as at Davos.

As to direct infection through the spraying of droplets containing bacilli, when coughing and speaking — this is to a large extent obviated by the discipline already referred to. It must not, however, be forgotten that this kind of infection is of no very great practical significance. It is interesting to see that Professor Saugmann has proved, in a careful research ("Zeitschrift für Tuberkulose", vol. VI., part 2), that out of 174 doctors who have been coughed on for years by sufferers from tuberculosis of the lungs and larynx, in sanatoria for lung complaints, only two fell ill of tuberculosis; of 64 larynx specialists not a single one, in spite of the fact that it is possible to

Ice-Hockey at Davos

English Skating Rink
at Davos

Ski-runners in the Sertig Valley

"Tailing" at Davos

cultivate tubercle bacilli experimentally from the mirrors, the forehead and the cheeks of doctors who treat laryngeal patients. This fact, that doctors who are continually exposed to such "rain of bacilli" so seldom become ill, enables one to see that the Flügge method of infection is of little practical significance. Saugmann is certainly right when he says: 'In ordinary intercourse it is therefore not at all, or only to an extremely slight degree, dangerous for healthy adults to associate with tubercular patients who are careful with their sputum, even although one may occasionally be coughed upon".

Now, as far as Davos is concerned, it must be taken into consideration that in consequence of the discipline already mentioned, one is certainly less frequently coughed on than is the case in the public life of any town.

We have now further to enquire what other measures are taken at Davos to exclude possibility of infection.

A public slaughter-house, in which all the beasts killed are subjected to veterinary inspection serves to prevent any possible infection from tubercular meat. Herr Gabathuler, the district Veterinary Surgeon, kindly informs me that tuberculosis (Perlsucht) is very seldom observed in cattle slaughtered at Davos. Last year tubercular changes were seen in only 2% of the bullocks slaughtered, while in Bavaria, for example, 9% were declared to be tubercular.

The milk supply is almost entirely in the hands of a Central Dairy under the control of the Medical Association. But even apart from such hygienic control, the chances of tubercular infection from milk are very small at Davos, for the reason that cattle-tuberculosis, and especially tuberculosis of the udder, is very rare. For example, in the year 1903/4 tubercular changes were only 9 times clinically observed among 2000 head of cattle. In this connection

it is to be observed that all cattle which become ill at Davos are seen by a veterinary surgeon, because all the animals are insured, and without a veterinary certificate no compensation is paid. In a communication kindly made by Dr. Isepponi, Cantonal Veterinary Surgeon, I find that in 1903 only 106 cases of tuberculosis occurred among cows throughout the canton. It is, moreover, only tuberculosis of the udder that is of any really great importance for this question. It is also interesting to learn that during seven years' practice the Davos District Veterinary Surgeon has only twice seen tuberculosis of the udder. These figures must appear quite abnormally favourable when compared with the state of things in other countries, and especially in the plains of Northern Germany, and in Denmark, the countries with highly developed milk industry.

Theoretically, therefore, we are bound to come to the conclusion that the conditions brought about at Davos by the climate, as well as by human agency, are such as, in spite of the number of sufferers from tuberculosis who congregate here, make the danger for healthy people of infection from tuberculosis appear very small — smaller in fact than in other places where neither the same precautions nor the same candour in the recognition of tuberculosis obtain. *It is especially important to emphasise the fact that a man who knows and acknowledges that he has tuberculosis, and lives according to the rules of hygiene, can do almost no harm, or at least very much less harm, to those among whom he lives, than the numerous people to be found in every place who have "chronic bronchial catarrh and catarrh of the pulmonary apices" or ever recurring "cold", or protracted "influenza", and who under all these euphemisms, because they are "non-tubercular", cough recklessly upon their neighbours.*

Now, the practical results testify to the correctness of these theoretical statements.

In the first place, it is the experience of all the resident doctors that healthy companions of tubercular patients (who often share the same room), that children who come with their parents, that the many thousands of servants, who make the beds and clean the rooms of the patients and come into the closest contact with them, do not become infected at Davos. It is rather the fact that all these persons equally experience a remarkable improvement of their general health through being at Davos — a fact especially noticeable in children. Turban ("Beiträge zur Kenntnis der Lungentuberculose") similarly reports that he has never known a healthy companion of an invalid become infected. Among his own staff, Turban has seen only one previously healthy person infected, and this was a servant-maid who was entrusted with the cleaning of the spittoons. *Volland* also (therap. Monatshefte, March, 1900) holds that intercourse with persons suffering from tuberculosis is quite free from danger.

Again, *Aebi* (Correspondenz-Blatt für Schweizer Aerzte, 1898—2), in a laborious examination of the question whether, after numerous tubercular patients have resided in a place, the mortality from tubercular causes has increased or not, — has proved, in the case of Davos itself, after examination of the census returns and the register of deaths, that the population in and around a health-resort of consumptives is not exposed to an increased danger of infection. Aebi's investigations covered the years 1847 to 1896, — a sufficiently long period. Owing to its situation, which cuts it off from the outside world, Davos is especially suited for such an investigation, and Aebi found that no increase had taken place in the mortality from tuberculosis.

This, too, in spite of the fact that many persons who had come to Davos suffering from tuberculosis, and whose complaint had become stationary or had been cured, had entered the ranks of the "burgesses"; i. e., of those who are not visitors *(Kurgäste)*.

In statistics extending over the years 1876—1900 the Davos Curverein has shown that of 648 deaths in Davos during this period, only 36 were due to tuberculosis, of which seven cases were certainly not contracted at Davos. The death-rate from tuberculosis among the Davos population amounts therefore to only 5.5, or strictly only 4.4% of the deaths from all causes, and in proportion to the number living is only 0.97%. These are certainly abnormally favourable figures; in proof of which I will only mention that in Germany (1894—97) 2.25% of the population died of tuberculosis.

Seeing then that other infectious diseases are also strictly isolated at Davos and that from an hygienic point of view the condition of the town is being continually improved, it must be admitted, after impartial investigation, that the danger of infection, whether from tuberculosis or other infectious diseases, is *extremely small. The fear of infection is therefore not justified*, and should no longer exist; so that the great boon which this incomparable spot can confer may be enjoyed by ever wider circles. In particular, weakly children and the neurotic should, more than has hitherto been the case, avail themselves of the curative factors of the Davos climate.

PRACTICAL HINTS FOR DOCTORS SENDING INVALIDS TO DAVOS

BY DR. K. TURBAN.

Only the doctor who examines and observes the patient and who also knows how the Davos climate is likely to affect him, is in a position to prescribe the right and proper treatment. This is by no means the same in each case. The nature of the complaints treated at Davos and the peculiarities of the high mountain climate, make it very dangerous for the patient to act on his own account, in accordance with general principles, on the lines of "natural" or other methods of cure, even so far as the simplest hardening and strengthening processes by means of air, water, and mountain-climbing come in question. But before the invalid at Davos places himself in the hands of any of the resident doctors, there are various important matters which he will have to decide, and if the doctor at home will advise his patient on the lines laid down in the present article, this will facilitate such decisions and enable the patient to avoid dangerous mistakes.

When it has been decided that a patient should be sent to Davos for the cure, he ought to be sent without delay, whatever the time of year, as soon as the necessity is recognised. Careful statistical comparisons of results have convinced me that a successful cure is quite independent of season. The preference accorded to winter

is purely a matter of fashion, and the patient who, for example, commences his "cure" during the dreaded period when the snow is melting, does equally as well as the winter visitor. To wait is only to lose precious time. The advantages of the Davos summer are set forth in another place. Anæmic patients, and such as feel the cold very much, become acclimatised more easily at any other time of year than winter, and if they do come for the winter cure they should arrive in the autumn, when the weather is on the whole still mild. They certainly should not come later than October.

In order to prepare the patient for his stay at Davos, the *length of the cure* must first be taken into consideration. In this connection patience will be required, and, even in the most favourable case, calculations must be made with months, not with weeks. Anyone who comes on a circular tour ticket will hardly reach any lasting result. In slight cases 3 to 5 months will sometimes suffice. When the "cure" is made in winter it will often be necessary to extent its duration on account of the inclemency of the lowland winter and, especially, the dangers of the lowland spring. Not infrequently the cure will extend to a year and more. Other things being equal, the chances of a lasting cure and of security against relapse are greater in proportion to the length of the treatment. Even when the treatment is merely preventive, it is not to be expected that the weakly constitution will be permanently altered in a few weeks. The duration of the cure will in such cases approach that of veritable invalids.

The right time to end the winter cure and return home is, generally speaking, the second half of May. Experience shows that lung patients are particularly

liable to relapses in the spring. The best way to avoid this danger is for the patient who has experienced a successful winter cure, to stay on during the spring in the place where he has become acclimatised. The melting of the snow involves no danger. All that is required is a certain amount of self-conquest in order to force oneself, after many months spent amid ice and snow, still to hold out patiently amid the sterner moods of nature at a time when from the intermediate stations, perhaps from the far-off homeland, the arrival of spring with its grass and flowers is announced by impatient friends and relatives. But many a one who has not been able to withstand the enticement, has forfeited the progress he had made during the whole long winter. Of course there are cases in which the cure may be brought to an end earlier; but the decision must rest with the doctor.

Short "cures", lasting one or two months, for the reinvigoration and recovery of overworked healthy persons, the neurotic, and convalescents after acute illnesses, may be beneficial at any time of the year, even in the middle of winter. In the same way, for similarly short periods, and also at any season, those who have previously gained their health by a long stay at Davos may at times derive advantage from a "cure" undertaken to establish and confirm the good result originally obtained.

Clothing should be chosen with due consideration for the long duration of the treatment and also to suit the rough and severe character of the high mountains. Very little opportunity will be afforded for the display of luxury and elegance. Warm clothes are necessary at all seasons: porous woollen materials are better than smooth close ones. Having regard to the considerable fluctuations of temperature which make themselves felt during the course

of the day, it is necessary that clothing of two different "weights" should be kept on hand. In summer a light material is permissible for the warmer part of the day: at Davos a frequent change of toilet is not vanity, but common-sense. Warm underclothing is indispensable, both for ladies and gentlemen. Those who before coming to Davos have not accustomed themselves to wool, may wear vest and drawers made of cotton or cotton and silk, in varying thicknesses to suit the time of year. Those whose skin is but little sensitive, may choose some cellular material. Such persons, however, as are used to wool will find that they must wear it always at Davos. Woollen articles of this kind should be frequently renewed, as, when properly cleansed, the woollen material soon loses its porosity. Stockings should be of wool or cotton, and in any case not thin. Boots and shoes should be solid and strong. The best of all are lace-up boots coming above the ankle, made of thick leather, with double soles and low heels. Fur and felt boots are too "coddling". Elegant low shoes with thin soles are no good on the high mountains, not even for the daintiest foot or for indoor wear. Snowboots (waterproof over-shoes coming up above the ankles, with rubber soles) are indispensable. Ordinary galoshes, which are at times useful enough, are not sufficient when there is snow on the ground. Leggings of leather or felt, the latter also in the form of puttees, and reaching to the knees, are a good deal worn in winter. A warm overcoat or jacket, and a lined jacket or fur coat for the open air cure in winter, are also necessary, and it is also advisable to have a lighter overcoat or mantle for walking. Capes, too, are quite suitable for both ladies and gentlemen when walking; but for the open-air cure the top garment must have sleeves. Shooting jackets, sweaters,

short fur coats, and leather jackets are also a good deal used. The visitor spending his first winter at a mountain health-resort is astonished at the great variety of modes and fashions brought into play to defend the human constitution against the cold. This remark applies to headgear as well. A kind of strong, woollen travelling-cap serves ladies and gentlemen alike for the rest cure. Double caps that can be pulled down over the ears, protect against the grimmest cold. Fur caps interfere too much with the ventilation of the head. For walking in the sunshine a straw hat is to be recommended, both summer and winter. A strong walking-stick with metal point is much affected, even by ladies. Two rugs (wool or plush) are required for the open air cure, in summer as well as in winter, and, in the latter season, a fur sack also, reaching above the knees, though a fur rug is still more suitable.

The patient who expectorates requires a Dettweiler *pocket spittoon*. This is also quite indispensable, and it is good to get the invalid accustomed to using it before leaving home.

When all has been provided that is necessary for the body, attention must be turned to procuring material for the employment and amusement of the patient's mind during the long period of treatment. At Davos he will find, for example, plenty of time and good opportunities for the study of literature and languages. It should furthermore be pointed out that the visitor, whether sick or sound, will find at Davos a large and good supply of all that he requires for his outfit.

The patient who comes to Davos for the cure should consider that his illness necessitates as a rule more *carefulness* than his own feelings may lead him to think; and also that he is going into a climate which must not

be trifled with, but whose peculiar properties must at all seasons be taken advantage of with the greatest foresight. Weakly patients, and those with fever, must leave all the anxieties and arrangements of the journey to a companion. Those who do not stand a long railway journey well, or are easily tired, should spend a night or more somewhere on the way (say at Rheims and at Basle). Longer halts at intermediate resorts with a view to gradual acclimatisation (much to be recommended when returning from Davos to the lowlands at the conclusion of the "cure") are not required on the outward journey, except in the case of patients with seriously weak hearts or with some heart disease. Sufferers from heart disease, however, will as a rule do better to avoid the altitude of Davos. While recommending, in general, a direct journey, I am of course assuming that the patient can travel in quiet and comfort, and that the counsels hereafter given as to what is to be done after arrival at Davos, are carefully followed out.

Every one who comes up out of the lowlands into the high mountains, has to go through a process of *acclimatisation*, even though he may not be aware that it is taking place. By means of very greatly enhanced formation of blood, the whole organism adapts itself to the reduced atmospheric pressure. Respiration and circulation (which in lung patients need special consideration) are the functions chiefly involved in this process of acclimatisation. Slight palpitation of the heart, a pleasant sensation of being able to breathe deeply, or an unpleasant sensation of being obliged to breathe deeply, slight bleeding of the mucous membrane of the nose, excitation of the nervous system, accompanied by sleeplessness, giddiness, and a feeling of fever when the temperature is in reality normal, are not

infrequently experienced even by apparently healthy persons. The process of acclimatisation occupies from 10 to 14 days, and it must now be quite clear why during this period, and, in particular, immediately after arrival, rest and precaution are insisted upon. Not only in the case of lung complaints and weakness of the heart, but also in the various forms of neurotic disturbance, this precautionary treatment is of the greatest importance. It sometimes happens that neurotic persons who are otherwise quite sound, are unable to get acclimatised on the high ıntains, merely because they thought themselves called ·n to rush about as much as possible during the first days, or even to apply themselves vigorously to sport. alids must be on their guard against sport of all kinds. st invalids, indeed, must make up their mind to keep ıy from the sports during the whole of their period of ıtment, and exceptions, such as a little skating (with ɔect to which the doctor has to decide), are quite out he question at the commencement of the cure.

The most important piece of advice, therefore, that be given to the patient going to Davos is that as soon possible after arrival he should put himself under the e of a *doctor*. If he has not decided to go into a sana- .um, and has no knowledge of the locality, he should up at some hotel, and, next morning at latest, consult octor as to all his further movements and decisions, n with respect to where he shall finally settle down ing his residence at Davos. If he has made up his mind go into one of the sanatoria, he should, if at all pose, go there direct from the railway station. In any case, vever slight his illness, the patient should ride in a riage or sleigh from the low-lying station to the higher ts of the resort, and *take no walk* until he has seen a

doctor. Cases are known to me in which the easily understood wish to go out exploring the new surroundings as soon as possible after arrival, has been disastrous in its consequences to the patient — even to the strong, slightly ill patient — for the remainder of his life.

It not seldom happens that the patient already has a temperature above normal when he leaves home, or the journey may have caused fluctuations in the previously normal temperature. This can only be known with absolute certainly when the temperature is taken with a thermometer once every two hours. At the outset, therefore, absolute rest in bed is in such cases necessary; and so it happens that many a patient who at home was in the habit of walking about, has to be sent to bed after arrival at Davos. And even the patient who is convinced that he has hardened himself in some other climate, is to be warned against being out of doors before sunrise or after sunset during the first few days. When the newcomer sees patients who are already acclimatised making the cure on the verandas and balconies until late in the evening, he is very easily tempted, in praiseworthy zeal, to imitate their example, and perhaps without being properly wrapped up. The healthy person even, who has a tendency to sit about at once in the open air without regard to wind, weather, or time of day, may do himself harm if he thinks he is capable of standing at least as much as the acclimatised invalid.

Even such patients as have always been accustomed to sleep with open windows at home, should proceed cautiously with respect to ventilation during the first few nights of their stay at Davos, on account of the greater cold.

With the assistance of his Davos doctor, the question

of where the patient shall live is easily answered. There is never any lack of sun and air anywhere at Davos, all the houses being detached. When the patient does not rent a flat or villa and set up his own household here, he should take a south room with a balcony. Rooms facing south are to be preferred at all seasons. For bedridden patients, rooms immediately under the roof are sometimes unpleasantly hot during the middle of the day at the height of summer; but even these are always cool at night. Balconies are valuable even when they are not used for the cure, as the doors afford better ventilation than windows. Larger and smaller balconies for general use are found at all sanatoria, at the larger hotels, and in many of the smaller hotels and boarding-houses. Patients who go to one of these houses need not be so particular in the choice of their rooms as those who have (or wish) to do the cure outside their own rooms. In this latter case the most suitable arrangement is a balcony facing south, with shelter overhead and at the ends, and, if possible, with weather-proof blinds in front. Of the south balconies which are not protected overhead, those are to be preferred which are at least sheltered at the east end. From an hygienic point of view, the east room is next best to that looking south. By far the greater number of rooms at Davos face south, south-east, or east. West rooms, looking towards the mountain-side, are very little better than north rooms. The prices vary in accordance with the order given above. Even when the patient spends the whole day in the open air, it is of course desirable that the sun should shine into his room for at least some hours daily; but the choice of room is of much greater importance when the patient has to keep his bed for any length of time. At Davos the size of the room, especially

in winter, is not so important as elsewhere, small rooms being more quickly ventilated and more quickly heated than larger ones, and also because when the patient is methodically carrying out the open-air cure, he is scarcely ever in his room during the daytime, even when the weather is bad.

There is a large choice of rooms of all kinds at the various sanatoria, hotels, boarding and lodging houses, and as a rule they are fitted and furnished on hygienic principles. In most of them the floor is covered with linoleum, and the walls with wainscotting or washable paper. The windows and balcony doors are provided with flap-ventilators at the top. Electric light and adequate heating arrangements are to be found everywhere. Rooms with central heating (low pressure steam or hot water heating), electric heating, or coke stoves, are to be preferred. Rooms which have been occupied by lung patients are officially disinfected.

The houses intended for the reception of invalid visitors may be divided into

I.

Sanatoria for the well-to-do. 700 beds.

Charge per day for room, pension, heating, light, baths, friction, and medical treatment: Fr. 10.50 to Fr. 20.— and more.

II.

Sanatoria for the less well-to-do and the indigent. 220 beds.

The English Home, the German Sanatorium for Less well-to-do Patients, the Basle Sanatorium, and the Dutch Sanatorium, are intended for invalids belonging to the nationalities in question. Patients are accepted in these

institutions only after certain formalities have been complied with. By way of *exception*, mild cases which are *not* Swiss, are accepted, when there is room, at the Basle Sanatorium, at a charge of from 5 to 7 francs per day.

III.

Large hotels and boarding-houses (1st. class). 1200 beds.

Charge per day for room, pension, heating, and light: Fr. 8.— to Fr. 15.—

IV.

Smaller hotels and boarding-houses. 1200 beds.

Charge per day (as in III.) Fr. 6.— to Fr. 11.—.

V.

Small inexpensive boarding and lodging houses. 550 beds.

Cost per day (including board in or out of the house) Fr. 4.50 to 7.50.

There are also furnished flats and villas at rents ranging from Fr. 1000 to Fr. 7000 a year. These are not numerous, and are generally let for the coming winter during the summer or early autumn.

In some establishments there is but little choice of rooms between November and April.

Information is given by the Davos Public Interests Association (Verkehrsverein Davos), whose offices are at Davos-Platz. "The Courier", a weekly paper published by the Public Interests Association, contains the news of the English Colony and of the health-resort in general, as well as a Visitors' List.

The most important railway routes from Great Britain to Davos are: London — Folkstone — Boulogne — Laon

— Basle — Zurich — Landquart (24 hours, 40 minutes). London — Dover — Calais — Laon — Basle — Zurich — Landquart (27 hours).

London — Dover — Ostend — Brussels — Strassburg — Basle — Zurich — Landquart (30 hours).

London — Newhaven — Dieppe — Paris — Basle — Zurich — Landquart (29 hours).

From Landquart, where one changes on to the narrow-gauge Rhaetian Railway, Davos is reached in from $2^3/_4$ to 3 hours. First comes Davos-Dorf and then Davos-Platz. There is no railway or post station called simply "Davos".

Davos Skating Rink

(31,000 sqr. yds.)

International Skating Competitions at Davos

Curling at Davos

PHTHISIS AND SPORT.

BY DR. A. F. BILL.

ife at Davos with its singular blending of pleasure and pain has been variously handled by English authors, and for the most part with much inaccuracy. A few years since a medical writer airily referred to our Alpine sports as "the penicious gaieties of Davos." In current fiction, in which the scene is laid at Davos, these amusements have chiefly served as a contrast to the tragedy of despair and neglect which the reader is asked to accept as a picture of local society. And more recently a writer in "The Times" shuddered at the fact that the sportsman should meet in the street here such numbers of consumptives, "many of them obviously in the last stages of the disease". We may reply that our medical critic was censorious, that the novelist distorted facts in order to present a problem, that the journalist was guilty of a definite misstatement. It remains that they are all three agreed upon one point, namely that the presence of sport in this invalid community is undesirable.

Those who know Davos best may doubt whether the interests of the invalid would be served if the local medical faculty succeeded in procuring the banishment of sport from the neighbourhood. Such criticisms are however always to be welcomed, all the more in the present instance in that they invite discussion upon a side of invalid life which, until recently, has been treated with scant appre-

ciation. Physicians are now in substantial agreement upon many of the cardinal points in dealing with tuberculosis and this fact increases the danger of too great rigidity of method in the handling of questions which mainly concern the individual temperament. Especially where one man has to supervise a large number of patients suffering from the same disease within the four walls of one institution, the temptation is great to codify the laws of therapy too thoroughly. If we may judge by recent publications, the experience of the past few years has brought about a change in the attitude of the English medical profession toward the consumptive. The stern magisterial tone of some of the earlier converts to German methods suggested irresistibly the inference of criminality in the patient, who must be coerced into subjection to a penitential system. Tidings came to the laity of so many gratuitous discomforts that they not unnaturally came to regard the new treatment as the pursuit of obesity under difficulties. The writer retains a vivid recollection of a meal at one of the older sanatoria, of the total lack of animation in the faces of the patients, of the indifference or even disgust with which they looked at their food and lastly of the Autocrat himself, driving at them with a mechanical humor which was woefully depressing. The authoritative prescription from morning till night of the smallest details gave a medicinal flavour to life and rendered laborious much that ought to have been pleasurable.

Such courses doubtless sprang in large measure from crude imidation but were probably also in part the results of old-standing misconception, which is dying hard, regarding the mental outlook of the average consumptive. Authors, medical and popular alike, have delighted to harp upon his incorrigible optimism. Text-books have

for instance emphasized the contrast between him and the cancerous patient. Few men indeed go through life without meeting several such invalids, passing away in the cheerful intoxication of advanced disease. It many be further admitted that, following a particular temperament, constitution or type of disease, certain individuals are stimulated rather than depressed. There still remains a whole world of nervous, introspective patients to whom getting well is a sad slow toil, and who may be usefully reminded by unexpected possibilities of activity that after all they are not beaten yet. It has been the lot of the writer to talk casually and unprofessionally with patients who had spent many months at health-resorts amidst the grandest scenery in the world. Almost invariably the sole fund of reminiscence has been the wearisome burden of egotism and disease.

Now that the capabilities and limitations of modern methods are more fully understood we are able to realize in how large a proportion of cases prolonged treatment in still necessary. It becomes the more important to make adequate provision not only for the clinical, but also for the social and the intellectual side of the patient's life. It is not enough that existence should be made tolerable: we must bestir ourselves to provide our patients with active interests if we would substitute a pervading healthy tone for a morbid local tension. A keenly observant layman long resident in Davos remarked that in his experience patients who had a hobby made the better progress. Sport is not the least valuable of such accessories to treatment. Most English men and women, especially those of the class which supplies the large majority of English visitors to Davos, are educated from childhood to a love of it. Few national proclivities are stronger than that which leads

John Bull to turn from the main columns of his newspaper and the affairs of Empire to the cricket or football reports. And however disputable may be the ethics of such devotion, here is at least a power which can win for the consumptive a temporary freedom from the weariness of introspection and from the thraldom of the clinical thermometer. Even if we admit that patients may perhaps occasionally pursue sport to undesirable lengths, yet by refusing altogether to countenance it we should place ourselves somewhat in the position of the schoolmaster who puts a comprehensive veto upon country walks, because one or two of his boys once upon a time abused their freedom. Nor do we further the cause of law and order by multiplication of vexatious restrictions. It does not need the confidences of former patients in divers sanatoria to tell us that the refusal of reasonable liberty spells covert licence. Sport is no bad moral instructor. Not "sport" purely for self-advertisement or gate-money, but sport as we learned it at school, clean and honourable.

In the first place and speaking generally, the soul of sport is in direct antagonism to some of the most evil tendencies of chronic disease. The lesson of the playing-field is a cheery free-masonry that lasts some men through life: honour, fair-play and self-sacrifice for the good of the side. While he centres his interests upon some grimy fragment of alien leather, the boy is learning not to be for ever seeking to save his own skin. The sense of comrade-ship, of strenuous endeavour, the helping hand to the beginner, the hero-worship, these and like influences combine toward a result not far short of chivalry. It is not a little pitiful to see how easily men who left school not so long since unlearn these manly doctrines under stress of moderate illness. In phthisis the patient is of

necessity taught to be scrupulously careful of his own personal well-being. He learns the importance of weight and temperature, and sometimes in an evil hour begins to study his complaint, a laborious and unwholesome research which leaves him sadly discontented to know so much and understand so little. He yields times without number to the temptation to converse on the subject which is uppermost in his mind. As to any social instinct, his duty to his neighbour hardly extends beyond the safe disposal of his sputa. In varying degree he tends to become captious, querulous, selfish, cowardly, hypochondriacal. Hence to bring him under an influence which revives the lessons of his schooldays is no slight gain.

But there is secondly an entirely opposite danger in the case of those who from the outset flatly refuse to fall into line with any confessed system. Those who of all others most need the restraint of a sanatorium are the most resolute in declining it. The most ardent apostle of types and stages must admit that there are many to whom it is not given to lead the classified life. This stubborn humour may prove a valuable asset to the patient, if he can be induced to interest himself in some healthy form of life. The mistake lies in seeming to do too much for him. In the pursuit of sport for pleasure he will often make as good a recovery as a more orthodox patient.

There have been of late years many articles in magazine and newspaper concerning Alpine sports. Some of these articles are only thinly disguised advertisements: but there is nevertheless such a sufficiency of more gennine literature by able exponents, whole-hearted lovers of the sport of which they write, as renders any detailed description within the limits of the present endeavour as superfluous as it would be presumptuous. The subject is

here treated from the medical standpoint and the jealous partisan of one or another form of sport will take notice that technicalities are omitted of set purpose. The regular winter sports at Davos may be said to begin some time in the second half of November with the opening of the skating-rink. At this date the British colony consists for the most part of invalids and their friends. The majority of those who come here for sport arrive during the Christmas holidays. In January and the first part of February the chief toboggan races and skating competitions take place. The rink closes in the first half of March and toboggan races end about the same time, though in sheltered spots tobogganing may still be possible for some weeks longer. Ski-running is usually left as the latest survivor of the winter sports.

With the advent of the sportsman Davos society gets a leaven of hearty, vigorous humanity which is invaluable in such a place. Thanks to the supplementing of the efforts of medical writers by the lay press, the public have acquired a view of the infectiousness of phthisis, which is a curious compound of truth and error. Would-be science runs amuck in the daily papers and one wonders at times whether a future generation will not altogether exclude the stranger from their gates on colourable suspicion of bacilli. At the present time the average layman who thinks about the matter at all has learned that the consumptive is to be regarded as a danger against which he needs to protect himself. But of the actual limitations of such infectiousness he has as a rule only a hazy knowledge and his feelings may be summed up as a general wish that the consumptive would remove himself to a distance and stay there. He is given to regard the sanatorium rather in the light of an isolation hospital and the

consideration that the patient may possibly get well is merely a more or less desirable *arrière-pensée.* In recognition of this altered social status of the consumptive many hotel-proprietors at health-resorts have found it politic in their public notices to pronounce his formal exclusion from their establishments. As a rule, though not invariably, the ban is enforced only in the case of obvious invalids, but, although one such announcement specifically limits its application to "ausgesprochene Lungenkranken", others have been less frank in blurting out the fact. Patients will now and again describe the subterfuges which they have to employ to gain admission. Thus the consumptive on his travels finds himself in some sort a social pariah and living among his kind, is apt to regard the world of health with that half-incredulity which the dweller in an asylum comes to feel toward sane humanity. At Davos this question was thoroughly dealt with years ago and visitors soon learn to appreciate the fact. Nor can the writer remember ever to have met with any member of the sporting set who expressed any fear of infection. So much has been written about the perfection of the local sanitary laws that strangers may be pardoned for receiving it all with some hesitation. The answer is that this reiteration is just as tiresome to us at Davos as it can possibly be to readers in England, but that as long as our critics continue to publish a priori assumptions of infection in the place of the facts which they will not be at the pains to ascertain, so long will further repudiation be necessary. Is it so hard to believe that sanitary regulations which have always met with success in sanatoria are no less effectual when applied to a whole community? Thus the invalid is perfectly free to come and go among the sporting set and, though there are one or two hotels which do

not receive invalids as guests, this fact does not really lessen the benefit gained by intercourse with the healthy world.

In actual practice it is most exceptional for the invalid to enter into disastrous competition with the athlete. The result to the consumptive of associating with the tobogganer is not to make him fling himself forthwith upon a toboggan and career madly down the steepest hill he can find. Whatever sport attracts him, he usually accepts his doctor's advice as to whether he can venture upon it at all and, given the permission, remains precisely as much under medical supervision as if he were limited to walking exercise. If he does not tire himself out, does not get overheated or chilled, keeps clear of accidents, if his appetite is increased and his spirits raised by recreation in the open air, if further his clinical report continues to improve, the physician has nothing to gain and everything to lose by being meddlesome and anxious on his behalf. It is perfectly true that these sports do not lend themselves to such accurate dosage as is theoretically supposed to be the case with walking exercise. But the nicest calculation of mileage and gradient is often of no avail if the patient is all the time carrying about with him the burden of a monotonous existence.

It remains to advert briefly to the individual sports. Tobogganing is emphatically a pastime for those in sound health. Its end and aim is speed, and it is common knowledge that high rates are attained. There are those indeed who continue to content themselves with tobogganing down short slopes not far removed from the horizontal, a mild excitement which can hardly do harm; but real tobogganing is another matter. Precisely what pace is reached at Davos it might be difficult to say. In the matter

of figures the tobogganer is much like the fisherman. But whatever it may be, thirty, forty, fifty miles an hour, it is prohibitive to the consumptive. A fall even into a snowdrift for a man travelling at such a rate might obviously be serious to a damaged lung. This does not exclude the possibility that a skilled performer might go on for years without mishap. The risk remains such as the medical profession is not called upon to countenance. At the same time it is an important point for the spectator as well as for the tobogganer that serious accidents are of the rarest occurence at Davos.

All forms of racing are popular and tobogganing is no exception to this rule. Round the principal fixtures centres much of the interest of the season. Certain of these races are open to all comers and help to unite the various nationalities in a sportsmanlike entente cordiale and it is a very cosmopolitan crowd that assembles on these occasions, with all the keenness of the turf yet free from the presence of its unsavoury adherents. As may be well supposed, such breezy enthusiasm stirs the whole atmosphere of Davos and the writer is free to confess that while he has never yet managed to see one of the great races, there is nothing in all the local sports that he would feel the loss of more. It is not necessary to take part or even to be a spectator in order to be carried away by the general interest. And herein tobogganing does good service within doors also. The sense of an available alternative makes a life of repose more bearable: just as the theatre which we are not visiting forms one of the attractions of a quiet evening at home. Further, even at the risk of repetition, it cannot be too often insisted that the conscious pursuit of health often defeats its own end and merely succeeds in producing a valetudinarian. It is to the credit of the

most attractive of our local sports that, as do others in varying degree, it diverts brooding minds from working slow physical destruction.

Skating is occasionally possible on the lake at Davos for a brief space early in the season, if the snow spares the ice, but otherwise takes place entirely on flooded ground. The ice-rink comprises three sheets of ice, a large public and a smaller private skating-rink, the latter reserved for members of the English skating-club, and lastly a curling-rink. Next to tobogganing skating is the sport which attracts most attention amongst English visitors. Davos may perhaps claim to be the chief centre for figure-skating in Europe. On the rink may be seen every stage from the humblest beginner up to the leading exponents of the art. Numbers of invalids skate and on a fine day the rink is a popular open-air club, where they can skate as long as they feel inclined or sit about chatting and watching the more proficient skaters. A stranger could ask for no more striking object lesson concerning the power of the sun at this altitude than the spectacle of invalids sitting about without overcoats and occasionally of skaters in their shirk-sleeves at a time when it is freezing hard in the shade. Admission to the English skating-club is gained by passing a so-called "test", which consists in the execution of certain figures to the satisfaction of two judges chosen from among the members of the club. The *kudos* attaching to the successful passing of his test is a spur to the ambition of many a beginner. Nor does he need to rest on his laurels after this first step. There are two higher tests to pass, and even then he will always find skaters who have something to teach him.

Chief among the physical advantages of skating to the consumptive may perhaps be placed the tendency to

rid the patient of that slouching carriage which is too often among the prodromata of phthisis. The varying degree of effort called for in skating probably tends, by demanding occasional deeper inspiration, to combat deficient expansion and the continual change of posture may be credited with a like effect, since it throws the greater amount of work now upon this lung, now upon that. In England at all events skating is so associated in the popular mind with the idea of inevitable falls that the English spectator at Davos might well be surprised that so few falls actually occur when skating becomes a daily exercise. This is of course a most important consideration with reference to the suitability of the sport for patients. As a rule it is the expert skater who has the worst falls; mainly on account of his greater power and also possibly because he does not anticipate falling. Pace-skaters run the greatest risk: but this is a form of skating unsuitable for invalids and seldom, if ever, attempted by them. There are a certain number who try to learn to skate, but find it so impossible to keep their balance that they are obliged to give up the attempt; but as a rule patients have already done some skating at home and have no such trouble.

Bandy, or hockey on the ice, affords an exciting spectacle. Only in its mildest interpretation could it be considered suitable for invalids. A good match is about as fast a game as one could wish to see.

Curling is a pastime less familiar in England than north of the Tweed. Of games upon dry ground the nearest equivalent is bowls, and one often hears the same frantic adjurations to a stone that refuses to curl as to a bowl that goes against the bias. It is a game of absorbing attractions and apparently the curler of a limp or lukewarm order is not allowed to survive, supposing that he ever

existed. The propulsion of stones, some 40 lbs. in weight, would seem at first sight a dangerous undertaking for a consumptive patient, but curlers are unanimous that the amount of force requisite is far less than might be supposed. And actual experience has shewn that in certain cases an expert player may without danger be allowed to play the game. It is an interesting game to watch and for this reason the curling-rink is a useful neighbour to the skating-rink. To the local and international skating competitions and to the chief matches at bandy and curling may be applied, mutatis mutandis, many of the remarks which have been made above with reference to tobogganing.

Ski-running has grown greatly in popularity during the last few years. It enables a man to leave the beaten track and roam at large over the snow. The ski-runner sees many a grand view which is of necessity hidden from the eyes of those who stand in smaller shoes. The devotees of the sport are unanimous as to its fascinations. Within certain strict limits it is permissible to invalids, but the more violents forms of the exercise, e. g. ski-jumping, and long, tiring excursions, are obviously to be forbidden.